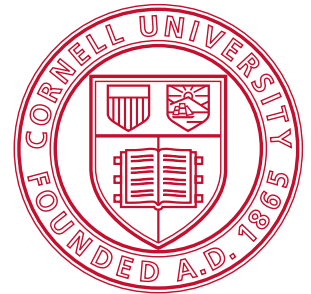


The Biometrics Unit The First 40 Years 1948–1988



by Walter T. Federer

BU-1000-M
February 1989
Biometrics Unit
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Credits

Copy editing and proofreading for this 2018 edition: Persephone Doliner of Ithaca, NY

Page Layout: J. Robert Cooke

Published by The Internet-First University Press

Ithaca, NY, USA

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The First 40 Years
1948–1988**

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ABSTRACT

The Biometrics Unit of Cornell University was established in 1947, with the first personnel hired and the first equipment purchased in 1948. It was placed in the Department of Plant Breeding, where Prof. H. H. Love was Head, as it was deemed inappropriate to establish a new department with only one professor. A Policy Committee for the Unit was very involved for the first two decades. Over the years, the academic staff has grown to seven full-time, some part-time, some joint, and several visiting faculty. The number of graduate students majoring in Biometry and/or Statistics has reached 21. The number of undergraduate majors in Biometry and Statistics peaked at 71 in 1985–86. The number of graduate students minoring in Biometry and Statistics peaked in 1980–81 at 59, when the number was reduced as the Faculty were overloaded. Many courses were taught over the years to meet the needs of students in the State Colleges at Cornell. Several of the courses have large enrollments and draw students from most of the Colleges and Schools at Cornell. Necessary computing equipment has been obtained to keep pace with changing computational needs of students in the courses and for graduate student research.

The vigorous research efforts of the Biometrics Unit has and is attracting many visiting scientists. During the 40–year period, 1,041 technical reports, 546 published papers, 21 books, and 132 theses were written. Of the theses, 21 were bachelor's, 55 were master's, and 56 were Ph.D. theses. The original goal of the Policy Committee and the College of Agriculture and Life Sciences was to hire faculty highly trained in Statistics but with a solid foundation in the agricultural and biological sciences. From the places where the papers have been published, the goal was well achieved. Thirty-two papers were published in the *Annals of Statistics*, 45 in *Biometrics*, 38 in animal science journals, 32 in medical science journals, and 62 in biological science journals. Some of the fields of research may be broadly categorized as statistical design, regression and linear models, sampling and estimation for biological populations, statistical genetics, statistical modeling, and statistical methodology.

1. INTRODUCTION

A history involves people, circumstances, events, and happenings. In this history of the first 40 years of the Cornell University Biometrics Unit, we discuss the founding and policy makers, the people, the teaching, the research, the consulting, the computing, the other activities, and the future outlook for the Biometrics Unit. A number of individuals actively associated with the Biometrics Unit over the years have been asked to submit comments on this history with the hope that they would be appended. However, none have been submitted.

The Biometrics Unit was established in 1947, with the first personnel being hired in 1948. One faculty position, one technical assistant (Biometrician), and one secretarial position were established initially. In addition, monies were made available for purchase of a number of Monroe, Friden, and Marchant desk calculating machines. These state-of-the-art machines, at that time, were for class and office use.

At one time, the Director of Resident Instruction, A. W. Gibson, and the Director of Finance, L. E. Slater, called it the "Biometrics Service Unit." It was never clear to the writer why the word "Service" was included and if it was a part of the name used initially in establishing the Unit. Since every academic group has been required to be part of a department, the Committee for the Unit and the College of Agriculture Administration decided that the Biometrics Unit should be attached to the Department of Plant Breeding, the department of the Committee Chairman, Prof. Harry H. Love. The Committee, which became known as the Biometrics Unit Policy Committee, worked closely with Biometrics Unit personnel on policy matters, on personnel, and on course offerings. Committee involvement gradually decreased over the years and was essentially phased out in the late sixties. Committee members were listed up to the 26th Annual Report of the Biometrics Unit in 1973 (See Table 1).

For many years prior to 1948, an introductory statistical methods course had been taught by Prof. Harry H. Love and later by J. R. Livermore in the Department of Plant Breeding. The Committee wished to update the course and to extend it to two semesters. The Committee decided that statistical methods at the content and level of George W. Snedecor's book *Statistical Methods*, 4th Edition in 1946, and material similar to that which later appeared in the book *Experimental Designs* by William G. Cochran and Gertrude M. Cox in 1949, should be available for students. The Committee also decided that a person trained as a statistician should be giving the courses. Up until this time an animal breeder, a plant breeder, an economist or other subject matter specialist who knew some statistical methodology had offered the courses in statistics in the College of Agriculture. This was a turning point since most statistics courses in the College and at Cornell since that time have been offered by individuals trained as statisticians. There also was a Statistics and Research Methods course taught in the Department; this course has been continued up until the present time. It was first taught by Professor Love and later by Professors Sanford S. Atwood and Carl C. Lowe.

The Policy Committee was a tower of strength for the Biometrics Unit, acting as a strong and motivating force during the Unit's formative years. The members of the Committee over the years are listed in Table 1. Professor Love was the first chairman, and he was followed by S. Atwood, since the Biometrics Unit was in the Department of Plant Breeding and since both were chairmen of the Department. These two individuals were powerful forces in getting the Biometrics Unit well started. One of the first tasks requested of the Professor In Charge of the Unit, W. T. Federer, was to prepare a 10-year plan of expansion for the Unit. The plan envisioned was for six faculty, two biometricians, and supporting staff, somewhere about the level of staffing at the end of the 40-year period.

Table 1. Members of the Biometrics Unit Policy Committee as Obtained from Annual Reports, by Year

NAME	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73
LOVE, H. H. Chm., Dept. Plant Breeding	x	x	x																								
BRUCKNER, J. H. Chm., Dept. Poultry Science	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
HILL, F. F. Chm., Dept. Agr. Economics	x	x	x	x	x	x																					
MUSGRAVE, R. B. Prof., Dept. Agronomy	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
PALM, C. E. Chm., Dept. Entomology	x	x	x	x	x	x	x	x	x	x	x	x															
SALISBURY, G. W. Prof. Animal Husbandry	x	x																									
FEDERER, W. T. Prof. in charge, Biometrics Unit		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
HENDERSON, C. R. Prof., Dept. Animal Husbandry			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
ATWOOD, S. S. Chm., Dept. Plant Breeding			x	x	x	x	x	x	x																		
GUTERMAN, C. E. F. Dir., Agr. Expt. Station				x	x	x	x	x	x	x	x																
HEDLUND, G. F. Chm., Dept. Agri. Economics						x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
MURPHY, R. P. Chm., Dept. Plant Breeding									x	x	x	x	x	x	x	x	x	x	x								
GIBSON, A. W. Dir., Resident Instruction										x	x	x	x	x													
GYRISCO, G. G. Prof., Dept. Entomology											x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
KENNEDY, W. K. Dir., Agricultural Expt. Station														x	x	x	x	x	x								
WATKINS, T. C. Dir., Resident Instruction															x	x	x	x	x								
PLAISTED, R. L. Chm., Dept. Plant Breeding																			x	x	x	x	x	x	x	x	x
BRADY, N. C. Dir., Agricultural Expt. Station																				x	x	x	x	x	x	x	x
EVERETT, H. L. Dir., Resident Instruction																				x	x	x	x	x	x	x	x

Because there was a Policy Committee for the Biometrics Unit and because the author decided they deserved a report of the Unit's activities, an Annual Report series was initiated in the Spring of 1949, and at this writing 40 continuous reports exist. Personnel, research, teaching, consulting, and other professional aspects are listed and described. To identify the various types of reports produced by the Unit, the following numbering system has been used:

B-xx	Books
BU-xxxx-M	Technical reports, of which this is number 1000
BU-xxx	Published papers
T-xxx	Doctoral, master's, and bachelor's theses
BU-xx-P	Unsolved statistical problems
BU-xx-C	Class demonstrations, problem or other teaching items.

In the designation BU-xxxx-M, BU was for the Biometrics Unit, xxxx was for the number of the technical report (now well over 1000), and M was for "mimeograph," since all technical reports were originally produced using a mimeograph machine. The mimeograph machine became obsolete with advances in photocopying and word processing. The reason for starting the BU-xxxx-M series was some consulting experiences. Occasionally during the course of a consultation, it was necessary to develop algebraic formulae for a statistical procedure not available in the literature. On one occasion, several pages of algebraic development were produced and given to the consultee. Two weeks later, another consultee needed the same results, which had to be rederived since no copy was kept. In order to save consultants' time and effort, it was decided to put such developments into the BU-xxxx-M series. Then, all technical developments were included in the series. Most, but not all, papers written by members of the technical staff are in this or the BU-xxx series. Since 1971, there has been a determined effort to have all papers produced in the Unit in the BU-xxxx-M series. It was at that time that S. R. Searle prepared an index, BU-205-M, of all papers of the Unit. The Annual Reports are not in the series but are simply listed from 1 through 40 and continuing. These Annual Reports, which form their own series, are highly useful instruments for administrative purposes, for seeking contracts and grants, and for general reference purposes.

2. ADMINISTRATION

The administration for the Biometrics Unit has been as follows:

Associate Chairman Biometrics Unit		Chairman Department of Plant Breeding and Biometry	
		H. H. Love	–1949
W. T. Federer	1948–77		
		S. S. Atwood	1949–55
		R. P. Murphy	1955–64
		R. L. Plaisted	1964–79
D. L. Solomon	1977–81		
		W. D. Pardee	1979–87
W. T. Federer	1981–83		
D. S. Robson	1983–85		
G. Casella	1985–86		
C. E. McCulloch	1986–		
		W. R. Coffman	1987–

In 1966, the name of the Department of Plant Breeding was changed to the Department of Plant Breeding and Biometry on the initiative of the plant breeders in the department. In 1977, the person in administrative charge of the Biometrics Unit was entitled “Associate Chairman of Biometry” instead of “Professor in Charge of the Biometrics Unit” as had been done for the first 29 years. This was more of a cosmetic change than anything else. Now, however, the Associate Chairman for Biometry is attending the College Department Heads Meetings on a regular basis whereas the “Professor in Charge” did not. The latest change in this title was to “Associate Chairman of Plant Breeding and Biometry” in 1987.

3. THE PEOPLE OF THE BIOMETRICS UNIT

3.1 *Faculty*

What any group is or becomes is determined by the people in that group and their nature. As already mentioned, when the Biometrics Unit was established, three positions and funds for computing equipment were allocated by the College of Agriculture in 1947. In filling the faculty position, Prof. Harry H. Love, Chairman of the Statistics Committee of the College of Agriculture and Head of the Department of Plant Breeding, began the search for possible candidates for the position. They were searching for a statistician interested and versed in agricultural and biological problems. Biologists with statistical expertise were among the candidates considered. For example, Dr. Max R. Zelle, who was the number three person in the U.S. Atomic Energy Program and who came to Cornell in 1948 as a microbiologist-geneticist in the Department of Dairy Science, was one of the candidates under consideration. Dr. Love interviewed candidates and their wives at their homebase. He liked to be invited into the home of the candidate. He was very conscious of the wife's role in the Department and in the College. Under Mrs. Love's leadership, there was a strong and active Department of Plant Breeding wives' organization known as Ceres.

Also, there was a very active and well-attended Plant Breeding faculty organization known as Synapsis. Dr. Love felt that the faculty member should be able to fit into Synapsis and that his spouse should fit into Ceres. This was above and beyond having professional expertise in the field. These desires came out of past experiences in the Department of Plant Breeding of having misfits as faculty and as spouses, which in some cases led to some highly undesirable experiences for the Department. The people he hired were all considered to be potential heads for the Department. In fact, when he was to retire and Dean W. I. Myers asked him who should be the next Head, he said, "Any member of the Department of Plant Breeding is suitable to head the Department." In this writer's opinion, the assemblage of a faculty who had such notable accomplishments in research, teaching, and leadership as this one, is probably the greatest accomplishment of Dr. Love, and he had many great accomplishments. He desired to select leaders and not followers. He wanted each faculty member hired to develop his own programs independently. He liked cooperation but only among leaders. The members he hired went on to several high-ranking positions, including Director of Extension (A. A. Johnson), Director of Resident Instruction (H. L. Everett), Dean of the Cornell Graduate School and later Provost (S. S. Atwood), President of Emory University (S. S. Atwood), Director of Biology at Brookhaven (H. H. Smith), Director of the Pineapple Research Institute and later of the Hawaiian Sugar Planters' Association (R. L. Cushing), Dean of the Cornell Faculty (R. P. Murphy), several heads of departments at Cornell, and many other leadership positions.

Dr. Love travelled to Iowa State College in late 1947 to interview W. T. Federer, who then was interviewed at Cornell in February 1948. He was hired as Professor of Biological Statistics and came to Cornell in August 1948. At the time Federer was hired, the College Administration stated that a second statistician would be hired within a year. It was the Administration's idea that hiring Charles R. Henderson as an animal breeder in 1948 fulfilled the promise. The writer and Chair of the Policy Committee were under the impression that the position would be in the Biometrics Unit. As a footnote, Charles R. Henderson always had an open invitation to associate with the Biometrics Unit but he chose not to; instead, he was on the Policy Committee, where he was a very effective and very strong supporter of the Unit. He has always been a collaborator on joint research with Unit personnel. The second professional person hired in the Unit was a biometrician, and the second person to fill this position was Douglas S. Robson (see Table 2). The second faculty person appointed was Robert G. D. Steel, in 1952, as an Associate Professor. The Policy Committee felt that additional statistics courses and statistical consulting were needed. Professor Atwood was able to obtain the support of 15 out of the 18 department chairmen in the College of Agriculture for this position over any in their own departments. The third faculty position was obtained in 1955, when Douglas S. Robson was hired as an Assistant Professor. This third position had the very strong backing of the Director of Research, C. E. F. Guterman, who appreciated the statistical consulting for College research projects and the statistical research of the Unit. The Biometrics Unit has had and continues to have strong administrative and financial support from the Office of Research.

Table 2. Professional Staff of the Biometrics Unit in Chronological Order of Appointment Showing Position Held
T = ASSISTANT PROFESSOR, B = BIOMETRICIAN, A = ADJUNCT PROFESSOR, S = SABBATIC, O = ASSOCIATE PROFESSOR,
I = INSTRUCTOR J = JOINT APPOINTMENT, C = CAREER DEVELOPMENT AWARD, P = PROFESSOR, F = FELLOW, R =
RESEARCH ASSOCIATE, E = EMERITUS PROFESSOR

Part 1 [left] (1948–61)

Year & Term	48	49	50	51	52	53	54	55	56	57	58	59	60	61
Name	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF
FEDERER, W. T.	P_	PP	PP	PP	PP	PP	PS	SP	PP	PP	PP	PP	PP	PP
BRANDRIFF, M. E.	B_	B_												
ROBSON, D. S.		B	BB	BB	BB	B_	R_	RT	TT	TT	TT	TO	OO	OS
STEEL, R. G. D.					O	OO	OO	OO	OO	OO	OS	SO		
DOWD, J. E.									II	I_				

Part 2 [middle] (1962–75) (The key precedes part 1; the year range differs.)

Year & Term	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Name	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF
FEDERER, W. T.	PS	SP	PP	PP	PP	PP	PP	PS	SP	PP	PP	PP	PP	PP
BRANDRIFF, M. E.														
ROBSON, D. S.	SO	CC	CP	CC	CC	CC	CS	CC	CC	CC	CC	CP	PP	PP
STEEL, R. G. D.														
DOWD, J. E.														
SEARLE, S. R.	_T	TT	TT	TO	OO	OO	OS	SO	OP	PP	PP	PP	PP	PS
CHOI, K.	_T	TT	TT	TT	TT									
REGIER, H. A.		_R	RR	R_										
SCHAFER, H. E.			_F	FF	F_									
RAKTOE, B. L.			_T	TT										
URQUHART, N. S.				_T	TT	TT	TT	TO	OO					
WANG, Y. Y.				_T	TT	TT								
GROSSLEIN, M. D.					_F	F_								
WEEKS, D. L.						_F	F_							
CHAPCO, W.						_F	F_							
SOLOMON, D. L.							_T	TT	TT	TT	TT	TT	OS	SO
HEDAYAT, A.								_T	TT	TT	TT			
SWALLOW, W. H.									II	I_				
MOUNT, T. E.									_T	JJ	JJ	JJ	JJ	OS
RATCLIFFE, L. H.									_R	RR				
RAO, K. C.									_R	R_			_F	FF
WRIGHT, V. L.									_F	FF				
CADY, F. B.										_P	PP	PP	PP	PP
DAVIDSON, R. R.										_T	TT	T_		
CORBEIL, R. R.										_F	FR	RR	R_	
POOLE, R. W.											_F	FF	F_	
BROWNIE, C.												_R	R_	
WOOD, C. L.												_T	TT	TT
VITHAYASAI, C.												_R	R_	
LINDLE, S. G.													_F	F_

Table 2 Part 3 [right] (1976–88)

Year & Term	76	77	78	79	80	81	82	83	84	85	86	87	88
Name	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF
FEDERER, W. T.	PP	SP	PP	PP	PP	PP	PP	PP	SP	PP	PE	EE	EE
BRANDRIFF, M. E.													
ROBSON, D. S.	SP	PP	PP	PP	PP	PP	PP	SP	PP	PP	PP	PE	EE
STEEL, R. G. D.													
DOWD, J. E.													
SEARLE, S. R.	SP	PP	PP	PP	PP	PP	PS	SP	PP	PP	PP	PP	PP
CHOI, K.													
REGIER, H. A.													
SCHAFER, H. E.													
RAKTOE, B. L.													
URQUHART, N. S.													
WANG, Y. Y.													
GROSSLEIN, M. D.													
WEEKS, D. L.													
CHAPCO, W.													
SOLOMON, D. L.	OO	OO	OO	OO	PP	P							
HEDAYAT, A.													
SWALLOW, W. H.													
MOUNT, T. E.	SJ	JJ	JJ	JP	JJ	JJ	JS	SJ	JJ	JJ	JJ	JJ	JJ
RATCLIFFE, L. H.													
RAO, K. C.	F_												
WRIGHT, V. L.													
CADY, F. B.	PP	PS	SP	PA	AA	AA	AA	AA	AA	AA	A_		
DAVIDSON, R. R.													
CORBEIL, R. R.													
POOLE, R. W.													
BROWNIE, C.													
WOOD, C. L	TT	TT											
VITHAYASAI, C.													
LINDLE, S. G.													
CHEN, C. Y.	FF												
SINGH, M.	_F												
SCHWAGER, S. J.			_T	TT	TT	TT	TT	TT	TT	TO	OS	SO	OO
FIREY, P. A.				II	I_								
JONES, E. W.				JJ	JJ	JJ	JJ	JJ	J_				
MEREDITH, M. P.					_I	II	II	II	II	II	IT	TT	TT
HUDSON, S.					_R	RR	R_						
CASELLA, G. C.						TT	TT	TO	OO	OO	OO	OS	SO
VELLEMAN, A.						_T	JJ	JJ	J_				
MCCULLOCH, C. E.						_T	TT	TT	TT	TT	TO	OO	OO
OBI, I. U.								FF					
BELDING, D. F.								_F	F_				
CLARK, L C											_T	TT	
BASFORD, K. E.											_F		
ALTMAN, N.												_T	TT
RUBIN, G. O.												_T	JJ
CASTILLO-CHAVEZ, C.													_T

Professor Shayle R. Searle came to Cornell University in 1962 as a statistical computing specialist for the Cornell Computing Center with the promise that there would be a tenure track faculty position. He was one of three Specialists hired; the others were Seymour Partir, mathematics, and Sydney Saltzman, industrial engineering. Toward the end of their three-year appointments, these three found that there were no tenure track positions available despite the promise. The problem for Searle was resolved by the then–Cornell University Provost S. S. Atwood, Dean C. E. Palm, and Director W. Keith Kennedy of the College of Agriculture. It was decided that he would be placed permanently in the Biometrics Unit but that his would be a new position rather than one of the Unit’s established positions. Since Searle was involved with computing, this would add another dimension to the Unit’s activities. At the same time, 1962, that Searle came to Cornell, Keewhan Choi was appointed as an Assistant Professor. Leslie N. Balaam, Kali S. Banerjee, B. Leo Raktoe, and Ying Y. Wang were visiting professors (with State and NIH support) who also helped with the teaching and consulting activities of the Unit in the 1963–65 period. Douglas S. Robson was awarded a ten-year NIH Career Development Award, 1964–74, freeing up a position which was filled by N. Scott Urquhart in 1965. A fifth position in the Unit was created when Foster B. Cady was appointed in 1971, specifically to take over the teaching of Stat and Biom 200 and consulting. In 1973, a sixth position was created for Douglas S. Robson.

Below is a summary of people holding the various positions over the years:

1.	Federer (1948–86), Altman (1987–)
2.	Steel (1952–60), Choi (1962–66), Solomon (1968–81), McCulloch (1982–)
3.	Robson (1952–63), Urquhart (1965–71), Davidson (1971–73), Wood (1973–77), Schwager (1978–)
4.	Searle (1962–)
5.	Robson (1973–87), vacant (1987–)
6.	Cady (1971–79), Casella (1981–)
6.5	Cady (1979–86)
7.	Castillo-Chavez (1988–)

Position 5 has not been filled because the Faculty have been unable to find the desired person. Position 6.5 was a half-time position supported on Dean’s funds and was not considered to be a position belonging to the Unit. Hence, when Cady resigned in June 1986, the half-time position was not continued. There was an interim assistant professor position established in the Unit in 1986–87 for Larry E. Clark, an epidemiologist; he left Cornell in Fall 1987 for the University of Arizona. The seventh position was created when Carlos Castillo-Chavez joined the Unit in June of 1988. Since he is a biomathematician rather than a statistician, the full implication of Biometry is now being realized and a new dimension was added to the Unit with his appointment.

The numerous visiting Faculty and Fellows associated with the Biometrics Unit (see Tables 2 and 3) have been a stimulating and motivating force. Interactions between the Faculty, Visitors, and Fellows have lead to many advances in teaching and research. Many new ideas and concepts have been brought by Visitors and Fellows; they have had a strong influence on the history of the Unit. Such individuals as Arnold J. King, George W. Snedecor, Frank Yates, David J. Finney, Oscar Kempthorne, Samuel Karlin, David R. Cox, and many more were stimuli that were greatly appreciated. People such as W. Scott Overton, Leslie N. Balaam, B. Leo Raktoe, D. Raghavarao, Esther Seiden, Frederick Pukelsheim, and others have been frequent visitors and contributors to the Unit’s program over the years. The Statistics groups at Cornell University have been fortunate in obtaining two Andrew D. White Professors-at-Large for Statistics. Samuel Karlin held this position in the 1970s, and Sir David R. Cox held this position in the 1980s (see Table 3).

3.2 Support Staff

The support staff for the Biometrics Unit has been excellent over the years. The secretarial staff became known all over the Cornell campus for their excellence and expertise in mathematical and statistical typing. During the early years, students’ wives were hired. Most were truly excellent but they left when their husbands graduated and moved on. The first career secretaries appointed were Donna Van Order (30 years with the Unit), Helen Seamon

Table 3. Visiting Professional Staff Working on Joint Research* (Top - Part 1 of 2)

Year & Term NAME	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86
THOM, H. C. S.	V																																		
BECHOFFER, R. E.		VV																																	
DUNNETT, C.		VV																																	
SOBEL, M.		VV																																	
COMSTOCK, R. E.			V																																
HOUSEMAN, E. E.				VV																															
NISSIN, O.						V																													
POWERS, L.									V																										
BANERJEE, K. S.											V	VV		V																					
OVERTON, W. S.											V		V								V														
BALAAM, L. N.												V	V				V																		
SHAH, K. R.													V																						
ROTHCHILD, B. J.														V																					
ROHDE, C. A.															V																				
TALLIS, G. M.																																			
HARVILLE, D.														V								V													
REGIER, H. A.																V																			
GROSSLEIN, M. D.																	V																		
PAULIK, G. J.																	V																		
NIVEN, B. S.																	V																		
PARKER, E. T.																																			
RAKTOE, B. L.																		V																	
SEIDEN, E.																		VV		V						V									V
TURYN, R. J.																		V		V		V													
COX, D. L.																		V																	
MARSHALL, C. E.																			V								V								
SILVA, J. A.																				VV		V													
PESOTAN, H.																				V															
HAYDOCK, K. P.																				V															
HEDAYAT, A.																					V														V

* v indicates that a visitor was working with Biometrics Unit Personnel for one week or more.

Table 3. Visiting Professional Staff Working on Joint Research* (Bottom - Part 2 of 2)

NAME	Year & Term		72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88
			SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF
RAGHAVARAO, D.			v							v				v		v	v		
DAVIDSON, R. R.			v																
ANDERSON, D. A.			v	v															
CARNEY, E. J.			v	v															
SRIVASTAVA, J. N.				v															
ALLEN, D. M.				v	v														
FLEMMING, A.				v	v														
OFERSTEN, J. T.				v	v	v													
NA NAGARA, P.							v												
KARLIN, S.							v		v		v		v						
DALE, D. K.								v											
HULTQUIST, R. A.								v	v										
ANDERSON, R. D.										v									
PUKELSHEIM, F.										v								v	
BANCROFT, T. A.																			
O'NEILL, M. E.										v									
BART, J.										v									
CORMACK, R.											v								
MURTY, B. R.												v			v	v	v		
BELL, G. W.															vv				
GLASBEY, C. A.															v				
LOWRY, S.															v				
BEKELE, I.															v	v			
GRIMES, B. A.															v				
COX, D. R.																v	v	v	v
CHEN, J. K.																	v		
FU, Z.																	v		
GWO, W.																	v		
LIU, Y. Y.																	v		
ALLEN, O. B.																	v	v	
BONDAR, J.																		v	
KAUFMANN, J.																		v	
BERGER, R. L.																		v	
HENDERSON, H. V.																		v	
ROBERT, C.																			vv
JAMES, E.																		v	

* V indicates that a visitor was working with Biometrics Unit Personnel for one week or more

Table 4. Secretarial and Support Staff of the Biometrics Unit (Part 1 of 2) [48-69]

NAME	Year & Term		48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69
	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF
Pearsall, Joan P.		X	X			XX	X																	
Davidow, W. F.			X																					
Pedersen, Annabeile			X	XX	XX	X																		
Wack, Ethel M.			X	X																				
Oliver, Barbara H.				X	XX																			
Robbins, Eunice L.				X																				
Boettcher, Dorothy						X																		
Resnick, O. Helen						XX	XX	XX	X															
Foster, Alison O.						X	X																	
Tomlinson, Percival S. A.							XX																	
Armijo, Yolanda										X														
Weed, Nola S.										X	X													
Evans, Charles V.										XX	XX	XX	X											
Beetle, Thomas M.										XX	XX	XX	XX											
Vogel, Barbara										X	X													
Beetle, Jean E.										X	XX													
Van Order, Donna										X	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
Leja, Stanley												X												
Bamberg, Jane												X	X											
Fuller, Helen												X	X											
Seamon, Helen M.													X	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
Torrie, Patricia														X										
Brust, Jean																	X							
Holeman, Betty J.																	XX	XX	XX	XX	XX	XX	XX	XX
McDowell, Marilyn																	X	XX	XX	X				
Revo, Lawrence T.																			XX	X				
Cohen, Rochelle																			X					
Laboffe, Margaret																				X				
Drake, Sharon																				X	X			
White, Anne M.																					X	XX	XX	
Cadun, Sevim																								
Phalen, Norma E.																								
Turturro, Charles A.																								
Price, Michael																								
Shaar, Gennel A.																								
Brown, Robert H.																								
Taylor, Kathryn J.																								
Kresge, Lelna																								
English, Joyce C.																								
Parente, Janice L.																								
Archin, Pamela J.																								
Marsh, Colleen L.																								
Roe, E. Donna																								
Dulcos, Mary W.																								
McCune, Ann																								
Yerex, Robert P.																								
Boles, Sandi L																								
Tien, Phyllis C.																								
Pierce, Kathryn S.																								

Table 4. Secretarial and Support Staff of the Biometrics Unit (Part 2 of 2) [70-88]

NAME	Year & Term																		
	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88
Pearsall, Joan	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF
Davldow, W. F.																			
Pedersen, Annabeile																			
Wack, Ethel M.																			
Oliver, Barbara H.																			
Robbins, Eunice L.																			
Boettcher, Dorothy																			
Resnick, O. Helen																			
Foster, Alison O.																			
Tomlinson, Percival S. A.																			
Armijo, Yolanda																			
Weed, Nola S.																			
Evans, Charles V.																			
Beetle, Thomas M.																			
Vogel, Barbara																			
Beetle, Jean E.																			
Van Order, Donna	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX			
Leja, Stanley																			
Bamberg, Jane																			
Fuller, Helen																			
Seamon, Helen M.	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX			
Torrle, Patricia																			
Brust, Jean																			
Holeman, Betty J.	X																		
McDowell, Marilyn																			
Revo, Lawrence T.																			
Cohen, Rochelle																			
Laboffe, Margaret																			
Drake, Sharon																			
White, Anne M.	XX	XX	XX	XX															
Cadun, Sevim		X	X																
Phalen, Norma E.			XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
Turturro, Charles A.				X															
Price, Michael				XX															
Shaar, Gennel A.				X	X														
Brown, Robert H.				X	X														
Taylor, Kathryn J.					XX														
Kresge, Lelna						XX	X												
English, Joyce C.								X											
Parente, Janice L.											X	XX	XX	X					
Archin, Pamela J.															XX	XX	XX	XX	XX
Marsh, Colleen L.																	XX	XX	
Roe, E. Donna																	X		
Dulcos, Mary W.																	X		
McCune, Ann																	X	XX	
Yerex, Robert P.																	X	XX	
Boles, Sandi L																		XX	
Tien, Phyllis C.																		X	
Pierce, Kathryn S.																		X	XX

Table 5. Graduate Students of the Biometry Unit (Half Year and Position) [1950–69]

g = graduate student, M = Master's awarded, D = Doctoral awarded, A = Assistantship, R = Research Associate, F = Fellowship, T = NIH Traineeship

Year & Term	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69
Name	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF
Robson, D. S.	g	gM		gg	gF	Fg	D													
NaNagara, P.		F	FF	MF	FF	FF	FF	FD												
Dowd, J. E.			A	AA	AA	AA	gg		gg											
Hobson, F. E.				A	A															
Potter, W. D.					F	F	M													
Ferris, G. E.						AA	A													
Thompson, K. H.							A	MA	AA	AA	AT	TR	RR							
Blischke, W. R.							A	AA	MR	RF	FF	AR	D							
Cassady, J. C.								AA	AA	RR	RR	RR	RM							
Alling, D. W.								FF	FF	FD										
Ebner, A. R.								A	AA	AM										
Vithayasal, C.								F	FF	FM	A	AA	AA	AA						
Douglas, A. W.									A	AA	AA	MA	AR	RR	D					
Mogi (IzumI), E. K.									A											
Atkinson, G. F.									A	RR	RR	RR	RR	RR	RD					
Rao, B. M.										A	AA	AA	AM	A						
Beetle, T. M.										R	RR	RR	RR	RR	MR	RR	RR			
Bakhit, B. O.											F	FF								
Raktoe, B. L.												FF	FM	FF	D					
Epstein, J. L.													T	TT	TA	A				
Ang, B. C.													T	TT	TM	T				
Mazumdar, S.													A	AA	AF	FA	AA	AD		
Townsend, E. C														T	TT	TT	TT	TT	D	
Winters, R. H.														A	A					
Fu, J. C.															A	AA	AM			
Jacobsen, R. L.															T	AA	TM	TT	D	
Li, G. Y.															A	AA	A			
Hedayat, A.																FF	MF	FF	FF	D
Ladlpo, O. O.																gA	M			
Paik, U. B.																AA	MA	AA	D	
Mosteller, R. C.																gg				
Revo, L. T.																AA				
Horn (Dodakis), S. H.																T	Tg	g		
Hughes, J. L.																A	AA	A		
Rao, K. C.																A	AA	AA	AA	AA
Swallow, W. H.																	T	TT	TT	TT
McCaughran, D. A.																	A	AT	TT	TT
Male, L. M.																	T	TT	TT	TT
Rudan, J. W.																	F	FF	FF	FF

Table 5. Graduate Students of the Biometry Unit (Half Year and Position) [1967–86]

g = graduate student, M = Master's awarded, D = Doctoral awarded, A = Assistantship, R = Research Associate, F = Fellowship, T = NIH Traineeship

Year & Term NAME	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86
	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF
Oakenfull, E.	AA	A																		
Maligalig, M. L.	A	A																		
Forbes, W. E.	T	TT	T																	
Harner, E. J.	F	FT	TT	TT	TT	TD														
Joiner, J. R.	R	AT	TT	TT	TT	TT	TD													
Martin, P. E.	T																			
Werner, L.		A	A		M															
Pollock, K. H.			AA	AA	AA	MA	AA	D												
Olltsky, M.			A	AA																
Baskerville, J. C.			T	TT	TT	TT	D													
Brownie, C.			A	AA	AA	AA	RD													
Longmuir, J.			A	AA	AA	AA														
Lee, F. L.				T	T	M														
Brown, G. H.				A	AA	AD														
Eccleston, S. A.				A	AA	AD														
Su, Y.					TT	T			T	M										
Klusek, C.					gg															
Schuirman, D. J.					TT	TT	TT	TT	MT	T										
Zambrano, F. O.					FF															
Zerdy, G. D.					TT	TT	TF	FA	AD											
Hsuan, A.					TT	TT	TT	D												
Ahn, Y. H.						T	TT	TT	TT	TR	RR	R								
Altevela, M. M.						T	TT	TT	TT	TM	A									
Balser, J. D.						F	FF	TT	MT	T					D					
Macken, C. A.						A	AA	AA	AA	AA	D									
Nait, R. C.						A	AA	AA	AA	D										
Rosenberger, J. L.						T	TT	TT	TT		D									
Horvath (Young), S. M.						A	AA	A			M									
Bell, W. D.							A	AA	A											
DeLacy, P. W.							F	FF	FM											
Eng, J. P.							A	A												
Hall, D. B.							A	AA	AA	MA	AA	A						D		
Hassan, S. Z.							A	AA												
Mandeli, J. P.							F	FT	TM	TA	AA	AD								
Nor, K. M.								FF	FF	FF	FD									
Allen, O. B.								A	AA	AA	AA		D							
Graves, T. S.								T	TT	TA	A		D							
Lee, H. F-C.								A	AA	AA	AA	AA								
Many, M. A.								T	TA	AA	M									
Shafiq, M.								F	FF	FF	FF	D								
Ebneshahrashoob, M									FF	FF	F									
Randall, J. H.									FF	M										
Fiery (Fliss), P. A.									AA	AA	AA		M							
Aref, S.									F	FF	FF	FF	FF	F				D		

Table 5. Graduate Students of the Biometry Unit (Half Year and Position) [1970–88]

g = graduate student, M = Masters awarded, D = Doctoral awarded, A = Assistantship, R = Research Associate, F = Fellowship, T = NIH Traineeship

Year & Term NAME	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88
SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF	SF
Rosas-Rello, A. R.						F													
Sivara, P.						F	FF	FF	M										
Nair, R. C.						A	AA	A											
Sheu, J. J.							gg	gg	g										
Chang, S. H.							F	FF	FF	FF	D								
Henderson, H. V							F	FF	AF	FD									
Grimes, B. A.							A	AA	AA	AM	A	D							
Kaplan, B. A.							A												
Skalski, J. R.							A	AA	AM					F	FF	D			
Berggren, T. J.								AA	AA			M							
Arneson, V. G.								A	AA	AA									
Kershner, R. P.								A	AA	A D									
McCulloch, C. E								A	AA	AA	AD								
Simon, M. T.								F	AA	AA	M								
Khare, M.								g	gA	M									
Wijesinha, A.								F	AF	AA	AA	AD							
Downing, J. K.									A	AA		M							
Breau, P.										A	AA	AA	AM						
Evans, J. C.										A	AA	AA	AA	AD					
Piegorsch, W. L.										A	AA	AA	AM	FF	D				
Meketon, M.										A	AA	A							
Berry, J. C.											A	AA	AA	AF	FA	D			
Cecce, M. A.											A	AA	AA	AM	AA	AA	D		
Crosling, R. D.											F	F							
Cullinan (Ims), V. A.											A	AA	AA	AA	MA	AA	AA	A	D
Maatta, J. M.											A	AA	AA	AM	AA	D			
Morris, J. D.											A	AA	AA	AA	AA	A			D
Meredith, M. P.											R	RR	RR	RR	RR	RR	RR	D	
Nolan, P. E.											A	AA	A						
Sitonik, W. K.											F	FF	FF	AF	D				
Umbach, D. M.												A	AA	AA	AA	AF	FF	Fg	gg
Zanelli, M. L.												F	FF	FF	FF	FD			
Babb, J. D.													A	AA	AA	AA	M		
Gomez-Riera, P. E.													F	FF	FF	M			
Kremers, W. K.													A	AA	AA	D			
Legall, G. P.													A	AA	AA	AA	D		
Jau, Y-F.														g					
Dixon, P. M.														A	AM				
Frongillo, E. A.														A	AA	AA	AA	AM	gg
Rubin, G.														A	AA	AA	AA	AM	RR
Stehman, S. J.														F	FA	AA	AA	AA	AD
Angellotti, V.															A	AA	AA	AA	AR
Greene, T. H.															A	A	D		

Table 5. Graduate Students of the Biometry Unit (Half Year and Position) [1970–88]

g = graduate student, M = Master's awarded, D = Doctoral awarded, A = Assistantship, R = Research Associate, F = Fellowship, T = NIH Traineeship

Year & Term NAME	70 SF	71 SF	72 SF	73 SF	74 SF	75 SF	76 SF	77 SF	78 SF	79 SF	80 SF	81 SF	82 SF	83 SF	84 SF	85 SF	86 SF	87 SF	88 SF
Bekele, I.																_F	FF	FF	FF
Goutis, C.																_A	AA	AA	_A
Haiso, R.-R.																_A	AA	M_	
Kane-Esrig, Y.																_A	AA	AA	AA
Li, S. C. Y.																_A	Ag	M_	
Lynn, H. S.																_A	AA	AA	AA
Matute, J. A.																_F	FF	FF	M_
Ngwengwe, A. M.																_F	FF	FF	AF
Feng, Z.																	_A	AA	AA
Forbes, A. B.																	_A	AA	AA
Gerow, K. G.																	_A	AA	AA
Lansky, D. M.																	_A	AA	AA
Reichert, D. L.																	_A	AA	AA
Strang, L. L.																	_A	FA	AA
Boudreau, M.																		_g	AA
Cappelleri, J.																		_g	AA
Martel, J.																		_g	A_
Yu, H.																		_g	AA
Zinn, V.																		_A	AA

(28 years), and Betty Holman. The third-longest-termed career Administrative Aide is Norma E. Phalen, who has been with the Unit for 16 years. Excellent and dedicated secretarial staff has been a great boon to the professional staff. Many individuals worked for shorter periods of time in various capacities. Funds for computer programmers have always been scarce and hence very few have been hired. The present professional statistics faculty are highly competent in computer usage and technology, but a computer programmer would be quite valuable for making their research and teaching activities more productive. The nature of the secretarial staff has changed considerably over the years with the advent of PC computers and word processors. For example, Pamela J. Archin and Norma E. Phalen are really becoming word processing technicians in addition to being first-rate secretaries.

3.3 Graduate Students

From the beginning, it was planned to have as many graduate students in the program as funds would allow. In the event that the Biometrics Unit was overcommitted for the number of students, funds would be taken from supplies and from part-time help. This was made possible by proper planning for supplies. It was the policy of the Unit to order items only once a month in order to reduce accounting time and charges. Also, funds that might be left over at the end of the year on State or Grant allocations were used to buy supplies for one to two years ahead. In the 1950s and 1960s it was not an uncommon sight to see the walls of the larger offices lined with boxes of mimeograph paper, bond paper, pads, and other office supplies. This stocking of supplies made it possible to run the Unit for a year or more without buying supplies should the money be needed for graduate student support. The Unit's first graduate student, Douglas S. Robson, together with Robert Bowles, was the recipient of the first undergraduate degree in Statistics in the United States; these degrees were received from Iowa State University in 1949. Robson was supported on the biometrician position, which was later divided into two State assistantships in 1954. The second graduate student was Prasert Na Nagara, who was supported on a National Thailand Fellowship during his sojourn at Cornell. The Unit's third graduate student, J. Edward Dowd, was supported on an A. J. King and National Analysts, Inc., Grant. When several contracts and grants and especially the NIH Training Grant

were discontinued in 1976, four additional State Assistantships were allocated to the Unit. Occasionally, additional assistantships were obtained via Dean's funds and from other units in the College and at Cornell. By the late 1950s and early 1960s, eight to ten graduate students were in the program. This has grown to twenty-one graduate students majoring in Biometry or Statistics as listed in the 40th Annual Report, 1987-88.

Two students who did not receive degrees but were certainly capable of getting them were J. Edward Dowd and Keith H. Thompson. In the early days of the program, graduate students were required to minor in mathematics. Most students selected Jack C. Kiefer as their minor committee member even when they were advised to select a mathematician. Professor Kiefer was very exacting, and many graduate students had a trying and difficult time getting up to standard in mathematics. For those competent in mathematics, he was very helpful. Professor Jacob Wolfowitz seldom took minors or majors in Statistics. He did, however, invite Douglas S. Robson to major under him but the offer was declined. He also served as the minor committee member for Anne R. Freeny (Ebner).

Of course, the Unit's most famous graduate major is Douglas S. Robson, the first student. Some that are internationally proclaimed as leaders in their field are B. L. Raktoc, A. Hedayat, J. Eccleston, C. E. McCulloch, and several others. One of several graduates from the minor program in Statistics and Biometry who is internationally famous is the Unit's own S. R. Searle. Other famous graduates are Henry Regier in Fishery Biology and David A. Harville in Statistics and Statistical Genetics. Several others have also established themselves and their reputations.

3.4 Undergraduate Students

The undergraduate major program in Biometry and Statistics began in 1961-62. The number of majors as listed in the Annual Report each year are:

	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10
1960s	0	2	3	3	7	4	3	13		
1970s			1	13	12	12	11	17	22	26
1980s	30	26	35	31	44	71	64	54		

Data were not immediately available for 68-69 to 71-72. There were proportionately large increases in 1967-68 after the initiation of the course Statistics and Biometry 200 and in 1985-86. The reason for the sudden jump for the latter years is unknown. With the present staff level, the undergraduate program cannot be increased without sacrificing other aspects of the program. In fact, it is already overcommitted in this area. A listing of over 100 students who graduated with a major in Statistics and Biometry is given in Table 6.

In the beginning, a Bachelor's thesis was required of all undergraduates by the student advisor Federer. The reason for this was that most would later be doing graduate work or working in research. When the number of advisees and advisors increased, other advisors did not require theses of their majors in most cases. At present, because of the relatively large number of advisees per advisor, requiring a Bachelor's thesis of everyone would be overwhelming. A number of students still elect to write a Bachelor's thesis, although there were none in 1988 out of the 17 graduating seniors.

3.5 Graduate Student Minors

The graduate minor program in Biometry and Statistics has always been a sizable and strong component of the Biometrics Unit. Complete information on all minors was not available from the Annual Reports, and the record keeping of the Cornell Graduate School did not allow procurement of a complete listing. A partial listing is given in Table 7, where minors in the first ten years are listed first. These are followed by a list from the 20th Annual Report of minors who became full-time statisticians, such as for example, Shayle R. Searle, or who are heavily engaged in statistical activities. Starting with the 32nd Annual Report in 1979-80, a listing of minors is given. In Table 7, a student is listed when his/her name first appears in the Annual Report. The numbers of minors listed by years are:

Year	79-80	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88
Number	52	59	35	42	46	44	56	56	44

The current relatively large load of undergraduate advisees led the Unit faculty to quit taking additional minors. More faculty are needed to handle the undergraduate and graduate minor programs. It is unreasonable, in light of teaching and research responsibilities, to let either group increase in numbers. Federer and Robson handled most minors, about 30 per year, up until the late 1960s. After that time the instructor of Stat and Biom 601 usually had the heaviest load of minors, although D. S. Robson had a relatively large number, around 20, right up until the time he retired. The writer feels that C. E. McCulloch has had too many (>20 per year) over recent years. This has changed to his now having a heavy load of majors and a small number of minors.

4. THE TEACHING OF THE BIOMETRICS UNIT

As indicated previously, the Policy Committee for the Biometrics Unit desired to have a statistical methods course at the level of G. W. Snedecor's Statistical Methods. The course would be for graduate students who needed statistical procedures for their thesis research. It was also desired that more than a perfunctory level of statistical design, both survey and experiment, be included. Plant Breeding 213 and 214, a two-semester three-credit-hour sequence, was devised to meet these goals. However, the original course material in 213 and 214, covering Snedecor as well as what later appeared in Cochran and Cox in 1949, was considered too strenuous for students, and the courses were considered to be undercredited. Hence, in 1953–54, two two-semester sequences, Plant Breeding 210-211 and 213-214, were introduced. 210-211 would cover the material in Snedecor, and associated with this sequence were two supplementary courses, 210A and 211A, which covered the algebraic aspects of various statistical procedures. The sequence 210-211 became 510-511 in 1964, and finally 601-602 in 1979, which is the present day course listing. The Plant Breeding designation was discontinued in 1966 and changed to Statistics and Biometry. The sequence 213-214 was on experiment and treatment design and analysis and became 513-514 in 1964 and finally 713-714 in 1976. Beginning with 1976, the nature of the course was changed from a two-semester sequence to two individual courses, one on experiment design (the arrangement of treatments in an experiment) and one on treatment design (the selection of treatments for an experiment). The reason was to accommodate the needs of graduate students from diverse fields.

The next set of courses developed by members of the Biometrics Unit was Statistics and Biometry 200, 408-409, and 417. A history of the development of these courses is given in Technical Report BU-588-M. The purpose of that report was to clear up misconceptions that were developing about the courses and their origin. It was also written to meet the occasional objections from the Department of Mathematics. They questioned (about every ten years) the reason for teaching a mathematics course, 417 matrix algebra, in the Biometrics Unit. There were also occasional objections to having 408 taught in the Unit. This is a basic probability course very akin to Math 371 (later 471) and five other courses in introductory probability at Cornell (three in Engineering, one in Economics, and a second one in Mathematics 370). The question arose as to why should a course so akin to Math 371 be given (see BU-588-M). A companion article, BU-587-M, was written on the teaching of service courses and who should do it.

An experiment with teaching 511 (now 602) was tried under the leadership of Constance L. Wood. Stat and Biom 511 was expanded and divided into six one-credit modules, 602-7, in 1977. Her idea was to tap the statistical expertise of the Faculty for a second semester course and to provide a series of alternative routes for graduate students. There were two modules on analyses of designed experiments, 602-3, two on regression, 604-5, one on nonparametric and distribution-free procedures, 607, and one on sampling and estimation for biological populations, 606. Since a large number of the same students took 602, 603, and 604 for credit, the material in 602, 603, and 604 was eventually combined into a four-credit-hour course much like the original 511, and it was renumbered as 602.

Course 605 still remains but involves more advanced regression procedures; 606 and 607 remain the same as originally given. It is not known what will eventually evolve for 606 with D. S. Robson's retirement or with 713 and 714 with W. T. Federer's retirement. One thing for certain is that the course content of these three will not remain the same. Hence, any courses listed under these numbers more than likely will represent new courses.

Responding to pressure from the School of Nutrition and the Field of Epidemiology, members of the Biometrics Unit (Clark, Federer, Robson, and Schwager) and of Operations Research (Bruce Turnbull and Tom Santner) offered a course on statistical methods for epidemiological studies starting in the Fall of 1984. Bruce Turnbull is currently bearing most of the burden for teaching this course.

Over the years pressure has been put on the Biometrics Unit to take over the teaching of Agricultural Economics 310, an introductory statistical methods course for economic and business undergraduate students. The Biometrics Unit faculty was agreeable, provided that a new position, two or more graduate assistantships, and secretarial support be provided to handle the teaching burden of this course. So far, there is an impasse on support, and Agricultural Economics now appears resigned to keeping the course. When Timothy D. Mount came to Cornell,

he was assigned to teaching this course, which he did most successfully for six years. The number of students increased dramatically during his teaching. However, he no longer teaches the course, and it has been unsatisfactorily taught at times, but these problems appear to be resolved at this writing.

Biometrics Unit personnel did succumb to pressure and presented Stat and Biom 215, Introduction to Statistical Methods, in Fall 1987 without securing an additional tenure track faculty, graduate students, and/or secretarial positions. Although the increasing number of undergraduates in Statistics and Biometry, the unsuitability of Agricultural Economics 310 and other courses at Cornell for some students, and the desire of more students for a course of this nature make the presentation of a course such as Stat and Biom 215 highly desirable, this writer feels that the additional support should have been agreed upon first. Let us hope that this is incorrect and that the support will be forthcoming when the College Administration becomes aware of the need for, and importance of, this course. M. P. Meredith is responsible for the syllabus for this course and for first presenting it.

Using increased enrollments in courses and student responses as measures of success, four individuals should be singled out for teaching Stat and Biom 601 (see Table 8). These are N. S. Urquhart, W. H. Swallow, D. L. Solomon, and C. E. McCulloch. This course has been a nemesis for several individuals in that many complaints about their teaching were received. To teach this course effectively requires a certain personality and ability. To illustrate, several students did not like a professor for 601 who was rated very low. However, in 602, these same students rated this person as one of the best teachers they ever had! These two courses have now evolved to the place where they are well accepted and taught. They are considered to be two of the most important courses offered by the Biometrics Unit. More effort goes into the teaching of these courses than any other of the courses offered by the Biometrics Unit.

The writer has never been able to understand why the enrollment in Stat and Biom 417, Matrix Algebra, did not exceed 100 to 200 students. This the only course of its type at Cornell; the lecturer (S. R. Searle) and material are excellent; and the material is needed for computer programming, statistical methodology, and solving simultaneous sets of equations. There are many graduate students in almost every field who have need for Matrix Algebra. Perhaps the need for this course is still to be realized. The course was divided into the Arithmetic of Matrices (416) and Matrix Algebra Theory (417) in 1976 but this did not appreciably increase numbers, and since many students took both 416 and 417, the course reverted back to a single course in 1987.

A listing of courses taught by Biometrics Unit personnel is given in Table 8. Numbers of students and the initials of the instructor(s) are also presented. Over the years, many special courses have been given to meet the needs of students, both graduate and undergraduate.

The Faculty have presented many short courses for widely diverse groups during the past 40 years. Course lengths varied from a half-day to over six weeks. The courses were given for groups outside of the Cornell community as well as internally. Most of these are listed in the Annual Reports.

Table 6. Undergraduate Degrees Received with a Specialization in Biometry and Statistics
(Name and year B.S. degree received; T denotes Bachelor's Thesis)

Kurtzer, Cheryl L.	65-T	Angellotti, Jon E.	81	Spalter, Paula A.	86
Ladipo, Olasupo O.	65-T	Gorelich, Amy S.	81	Wright, Jill A.	86-T
Cooper, Janet	68-T	Lockhart, James A.	81	Barnett, Jill R.	87
Li (Lin), Flora	68-T	Sneibacher, Beth A.	81	Berger, Vance W.	87-T
Werner, Linda	68-T	Suss, Marlene R.	81	Cioppa, Lauren M.	87
Fisher, Alan C.	69-T	Angelos, Anna N.	82-T	Foster, Jameson M.	87
Keller, Kirstin J.	69-T	Gnazzo, Laura A.	82	Gaines, John A.	87
Cardaci, Frank	70-T	Jucha, Peter	82	Hahn, Judith A.	87
Schieren, Gail	70-T	Manning, Susan A.	82	Heasley, Heidi K.	87
Schmukler, Joan	70-T	Mischler, Mary E.	82	Holzanger, Jodi E.	87
Wasserman, Cheryl	70-T	Penner, Lori E.	82	Kappler, Kimberly A.	87-T
Crown, Ian J.	72	Potter, Bernice M.	82	Karmen, Randi M.	87
Spencer, Bruce D.	72	Safran, Barbara E.	82-T	Klein, Nancy H.	87
Baumes, Harry S.	74-T	Annarella, Erica M.	83	Reynolds, Kellie J.	87
Ondra, Thomas L.	74	Dechter, Aimee	83-T	Shirk, Melissa	87
Smith, Linda L.	74-T	Edelstein, Sharon L.	83	Taurence, Lisa A.	87
Pearl, Robin L.	75-T	Hsu, Ming-Ann	83	Zinn, Jack H.	87
Saunders, Danny A.	75-T	Rhodes, Karen E.	83	Berkowitz, Melissa S.	88
Brenner, Kathleen A.	76	Saunders, Mareen S.	83	Berzups, Sandra D.	88
Brimer, Arlene	76	Weinstein, David R.	83	Diminich, Lisa M.	88
Cooperberg, Debra A.	76	Bogart, Keith	84	Doucette, John	88
Haller, Susan M.	76	Friedman, Debra	84	Goldberg, Pamela	88
Schneider, Iris M.	76	Klugman, Susan	84	Kisslinger, Kathryn A.	88
Burling, Stephen R.	77	Sloan, Judith	84	Lalley, Megan M.	88
Colgan, Jamie	77	Costa, Johanna E.	85	Lee, Jennifer	88
Hall, Robert B.	77	Frank, Melissa C.	85	Lieblein, Andrea M.	88
Lippe, Stuart	77	Gerber, Ann Marie	85	Monard, Scott P.	88
Cirulli, Philip	78	Pless, Theodore L.	85	Reidy, Edward D.	88
Myer, Christine H.	78	Russell, Mark W.	85	Ryan, Stephanie J.	88
Tassone, Vanessa A.	78	Erlichman, Mindy A.	86	Strober, Jonathon B.	88
MacWilliams, Sherry L.	79	Gallinger, Kathleen E.	86	Tassone, Kristina A.	88
Crandall, Joan W.	80	Kendall, John H.	86	Thomas, Zachary L.	88
Schneider, Laurence M.	80	Paroff, Jodi F.	86	Useloff, David M.	88
Segal, Yvette L.	80	Scinto, Philip R.	86-T	Wager, Carrie G.	88
Taub, Jeffrey B.	80	Sheehan, Darlene M.	86		

Department of Plant Breeding and Genetics Graduate Degrees and Students

Africa	MSA & MS	Ph.D.	Total	Students
Egypt	2	6	8	7
Nigeria	2	3	5	5
Sudan		4	4	4
Ghana	2	2	4	3
Zaire	2	1	3	3
South Africa	2	1	3	3
Liberia	2		2	2
Botswana		2	2	2
Kenya		1	1	1
Tanzania	1		1	1
Zimbabwe		1	1	1
Ivory Coast		1	1	1
Cameroons	1		1	1
Gambia	1		1	1
Rwanda		1	1	1
Somalia		1	1	1
Malawi		1	1	1
Total	15	25	40	38

Europe	MSA & MS	Ph.D .	Total	Students
Great Britain	3	3	6	5
Netherlands	3	2	5	4
Yugoslavia		3	3	3
Iceland	1	2	3	3
Greece	2	1	3	2
Russia	2	1	3	2
Spain	1	1	2	2
France		1	1	1
Germany	1		1	1
Denmark		1	1	1
Italy		1	1	1
Latvia		1	1	1
Total	13	17	30	26

**Table 7. Partial List of Graduate Students Minor in Biometry and Statistics 1948–59
(from 10th Annual Report)**

STUDENT	DEGREE*	MAJOR FIELD
Aird, P. L.	D57, RS	Forest Conservation
Blackwell, R. L.	D53, WF	Animal Breeding
Cassady, C. F.	D62, WF	Soils
Duangratana, S.	M57, RS	Plant Breeding
Dunbar, R. S.	D52, WF	Animal Breeding
Dunsubutra, A.	M56, RS	Genetics
Elston, R. C.	D59, WF	Animal Breeding
Freeman, A. E.	D56, WF	Animal Husbandry
Grosslein, M.	D??, DR	Fishery Biology
Hafs, H. D.	D??, WF	Animal Husbandry
Hart, C.	M??, DR	Plant Breeding
Hatch, R.	D??, DR	Fishery Biology
Hickman, C. G.	D54, WF	Animal Breeding
Hoyt, P. B.	M??, WF	Soil Technology
Hurst, R. L.	D52, WF	Agronomy
Ike, A. F.	M57, RS	Forest Soils
Jerome, F. N.	D56, WF	Animal Genetics
Jones, K.R.	D??, WF	Plant Breeding
King, S. C.	D53, WF	Animal Genetics
Lowe, C. C.	D52, WF	Plant Breeding
Lund, W.	D??, DR	Ichthyology
Lyman, J. F.	M??, WF	Poultry Husbandry
Moxley, J. E.	D66, WF	Animal Breeding
O'Bleness, G. V.	D??, WF	Animal Breeding
Murty, B. R.	D60, WF	Plant Breeding
Regier, H.	D??, DR	Fishery Biology
Schlottfeldt, C. S.	D53, WF	Genetics
Searle, S. R.	D58, WF	Animal Breeding
Shearo, R.	D??, WF	Agronomy
Shorey, H. H.	D??, WF	Entomology
Self, R. D.	D57, WF	Vegetable Crops
Skory, J.	D51, WF	Agronomy
Thompson, J.	D??, DR	Plant Breeding
VanVleck, L. D.	D60, WF	Animal Breeding
Ward, D. B.	D??, RS/DR	Botany
Warren, J. A.	D60, WF	Vegetable Crops
Wheeler, D.	D??, DR	Plant Breeding
White, S. B.	M58, DR	Plant Breeding

* Degree (M=Master's, D=Ph.D.), year degree awarded, minor committee member (WF=W. Federer, RS=R. Steel, DR=D. Robson).
Record of year degree awarded not always available.

**Minors known to be working as full-time statisticians or heavily involved
in statistical applications (from 20th Annual Report)**

Allaire, F. R.	(D?? in Animal Breeding)
Almohammed, M. T.	(D68 in Plant Breeding)
Blackwell, R. L.	(D?? in Animal Breeding)
Cunningham, E. P.	(D?? in Animal Breeding)
Doolittle, D. P.	(D59 in Animal Genetics)
Duangratana, S.	(M57 in Plant Breeding)
Dunbar, R. S.	(D52 in Animal Breeding)
Elston, R. S.	(D59 in Animal Breeding)
Freeman, A. E.	(D56 in Animal Husbandry)
Grosslein, M.	(D?? in Fishery Biology)
Harville, D. A.	(D65 in Animal Breeding)
Heidhues, T.	(D61 In Animal Breeding)
Hickman, C. G.	(D?? in Animal Breeding)
Hill, R. R.	(D64 in Plant Breeding)
Hurst, R. L.	(D52 In Agronomy)
Jerome, F. N.	(D56 in Animal Genetics)
King, S. C.	(D53 in Animal Genetics)

Koh, Y. O.	(D67 in Animal Science)
Lee, A. J.	(D66 in Animal Breeding)
Mackey, B. E.	(D66 in Plant Breeding)
Meredith, W. R.	(D?? in Plant Breeding)
Miller, R. D.	(D68 in Animal Breeding)
Murty, B. R.	(D60 in Plant Breeding)
O'Bleness, G. V.	(D?? in Animal Breeding)
Regier, H.	(D67 in Fishery Biology)
Rothschild, B. J.	(D62 in Ichthyology)
Searle, S. R.	(D58 in Animal Breeding)
Self, R. D.	(D57 in Vegetable Crops)
Skory, J.	(D51 in Agronomy)
VanVleck, L. D.	(D60 in Animal Breeding)
Warren, J. A.	(D60 in Vegetable Crops)
Wearden, S. A.	(D57 in Animal Breeding)
White, S. B.	(M58 in Plant Breeding)

Graduate minors in Biometry and Statistics for 1979–80

Name	Major Field	Minor Professor	Degree
Allen, M. S.	Animal Science	Solomon	M.S.
Agyemang, K.	Animal Science	Solomon	Ph.D.
Babb, J.	Animal Science	Searle	M.S.
Bart, J. R.	Natural Resources	Robson	Ph.D.
Beatty, S. W.	Agronomy	Solomon	M.S./Ph.D
Blanchard, P. J.	Animal Science	Searle	M.S./Ph.D
Bruhn, J. A.	Plant Pathology	Solomon	M.S./Ph.D
Chow, M. S.	Mathematics	Solomon	Ph.D.
Clark, R. D.	Biochemistry	Solomon	Ph.D.
Coors, J.	Plant Breeding	Federer	Ph.D.
Dahlan, M.	Plant Breeding	Federer	Ph.D.
Delorenzo, M.	Animal Science	Searle	Ph.D.
Dixon, P. M.	Ecology	Solomon	Ph.D.
Edlin, K. M.	Animal Science	Solomon	M.S.
Famula, T. R.	Animal Science	Searle	Ph.D.
Farah, F. H.	Natural Resources	Robson and Solomon	Ph.D.
Flegel, K.	Nutrition	Solomon	Ph.D.
Fohner, G. R.	Agrlc. Economics	Solomon	Ph.D.
Gomez-Cuervo, P. L.	Plant Breeding	Solomon	Ph.D.
Guthrie, C. A.	Aquatic Science	Solomon	M.S.

Name	Major Field	Minor Professor	Degree
Heimbuch, D. G.	Natural Resources	Solomon	Ph.D.
Heist, G. P.	Agronomy	Solomon	M.S./Ph.D.
Huarte, M. A.	Plant Breeding	Federer	Ph.D.
Huenneke, L. F.	Ecology	Solomon	Ph.D.
Iniguez, L.	Animal Science	Solomon	Ph.D.
Jahari, A. B.	Nutrition	Solomon	M.S.
Jennison, C.	Operations Research	Robson	Ph.D.
Kautz, J. E.	Natural Resources	Robson	Ph.D.
Lagier, R. F.	Entomology	Solomon	Ph.D.
Manfredl, E. J.	Animal Science	Searle	M.S.
Merow, C. B.	Education	Solomon	Ph.D.
Miesen, D. L.	Geophysics	Solomon	M.S.
Musi, D. O.	Animal Science	Searle	M.S.
Nowogrodzki, R.	Entomology	Solomon	Ph.D.
Palmer, J. R.	Plant Pathology	Solomon	M.S./Ph.D.
Rafferty, A. P.	Nutrition	Solomon	Ph.D.
Rubin, G.	Botany	Solomon	Ph.D.
Sangrey, K. A.	Agronomy	Solomon	M.S.
Schnelberger, C. P.	Animal Science	Solomon	M.S./Ph.D.
Smith, S. P.	Animal Science	Searle	Ph.D.
Staggs, M. D.	Natural Resources	Robson	M.S.
St.Clair, J.	Statistics	Solomon	M.S./Ph.D.
Stehouwer, R. C.	Agronomy	Solomon	M.S.
Taigen, T. L.	Ecology	Solomon	Ph.D.
Throne, J. E.	Entomology	Solomon	Ph.D.
Udedibie, A. B.	Animal Science	Solomon	M.S.
Ushman, N. L.	Business	Solomon	Ph.D.
Wilson, M. V.	Ecology	Solomon	Ph.D.
Woods, K. D.	Ecology	Solomon	Ph.D.
Wright, S. A.	Agronomy	Robson	Ph.D.
Zack, J. W.	Atmospheric Sci.	Solomon	Ph.D.
Zertucke-Cazares, L.	Food Science	Federer	Ph.D.

Additional graduate minors in 1980–81

Name	Major Field	Minor Professor	Degree
Akyeampong, M. P.	Agronomy	Solomon	M.S.
Allen, M. L.	Animal Science	Solomon	Ph.D.
Cairns, S.	Ecology	Solomon	Ph.D.
Craig, C. L.	Ecology	Solomon	Ph.D.
Crooks, J. R.	Vegetable Crops	Federer	Ph.D.
Fadel, J. G.	Animal Science	Solomon	Ph.D.

Name	Major Field	Minor Professor	Degree
Forbes, T. R.	Agronomy	Solomon	Ph.D.
Hotchkiss, C. M.	City and Reg. Plan.	Searle	Ph.D.
Hudes, E. S.	Civil Engineering	Solomon	M.S.
Jones, D. Y.	Nutrition	Solomon	Ph.D.
Minoque, K. P.	Plant Pathology	Solomon	Ph.D.
Okagaki, L. R.	Human Development	Federer	Ph.D.
Pan, W. H.	Nutrition	Solomon	Ph.D.
VanBruggen, A. H. C.	Plant Pathology	Solomon	Ph.D.

Additional graduate minors in 1981–82

Name	Major Field	Minor Professor	Degree
Babb, J. S.	Animal Science	Searle	M.S./Ph.D.
Can, Z. C.	Environ. Eng.	Schwager	Ph.D.
Coors, J. G.	Plant Breeding	Federer	Ph.D.
Dahlan, M.	Plant Breeding	Federer	Ph.D.
Delorenzo, M. A.	Animal Science	Searle	Ph.D.
Horton, J. T.	Nutrition	Casella	M.S.
Lawlor, T. J., Jr.	Animal Science	Federer	Ph.D.
Maddox, G. D.	Ecology	Robson	Ph.D.
Mehlenbacher, S. A.	Plant Breeding	Federer	Ph.D.
Richardson, G.	Accounting	Schwager	Ph.D.
Schmidlin, T.	Atmospheric Sci.	Schwager	Ph.D.
Westell, R. A.	Animal Science	Federer	Ph.D.

Additional graduate minors in 1982–83

Name	Major Field	Minor Professor	Degree
Allen, M. A.	Animal Breeding	Federer	Ph.D.
Beltramino, F. E.	Animal Breeding	McCulloch	Ph.D.
Boyce, T. M.	Entomology	McCulloch	Ph.D.
Esrey, S. A.	Agric. Economics	Casella	Ph.D.
Higgins, W. P.	Microbiology	Robson	Ph.D.
Lichtenstein, C. H.	I.& L.R.	Schwager	Ph.D.
Mirande, S. L.	Animal Breeding	McCulloch	M.S.
Oberbauer, A. M.	Animal Science	McCulloch	Ph.D.
Rivera, J. A.	Nutritional Science	Robson	M.S./Ph.D.
Tufts, D. A.	Nutritional Science	Casella	Ph.D.
Ycas, J. W.	Plant Genetics	Casella	Ph.D.

Additional graduate minors in 1983–84

Name	Major Field	Minor Professor	Degree
Caracelli, V. J.	Human Development	Schwager	Ph.D.
Carroll, M.	Floriculture	McCulloch	Ph.D.

Name	Major Field	Minor Professor	Degree
Cohen, R.	Plant Science	Casella	Ph.D.
DeVeers, C.	Animal Breeding	Searle	M.S./Ph.D.
Feng, Z.	Entomology	Robson	M.S./Ph.D.
Friedman, J.	Psychology	McCulloch	M.S.
Grant, J.	Business	Casella	Ph.D.
Greenhaigh, S.	Animal Breeding	McCulloch	M.S.
Hoy, C.	Entomology	McCulloch	Ph.D.
Joesch, J.	Consumer Economics	Casella	Ph.D.
Kennedy, D. B.	Bus. & Public Admin.	Schwager	Ph.D.
Loria, K.	I. & L R.	Casella	M.S.
Marks, G.	Nutrition	McCulloch	M.S.
Milgroom, M.	Plant Pathology	McCulloch	Ph.D.
Pappalardo, J. K.	Consumer Econ.	Schwager	Ph.D.
Reynolds, K. K. L.	Plant Pathology	McCulloch	M.S.
Stanley, B. H.	Entomology	Robson	Ph.D.
Stelzner, J. K.	Ecology & Evol. Bio	Schwager	Ph.D.
White, R.	Floriculture	McCulloch	M.S.
Woodward, B.	Animal Science	Searle	M.S.
Wright, B. H.	Animal Breeding	Federer	Ph.D.
Yerex, R. P.	Animal Breeding	Searle	Ph.D.
Zhao, Y.	Entomology	Robson	M.S./Ph.D.

Additional graduate minors in 1984–85

Name	Major Field	Minor Professor	Degree
Abu-Libdeh, H. I.	Oper. Res. & Ind. Engr.	McCulloch	Ph.D.
Cone, R. S.	Natural Resources	Robson	M.S.
DeVeer, J. C.	Animal Breeding	Searle	M.S.
Dixon, P. M.	Ecology & Evol. Bio.	Schwager	Ph.D.
Dong, M.	Animal Breeding	Federer	Ph.D.
Evans, R. A.	Natural Resources	Robson	M.S.
Kahn, A. E.	Natural Resources	Robson	M.S.
Kenrick, C. J.	Nutritional Scl.	Robson	Ph.D.
Lin, E. Y.	Consumer Economics	Robson	Ph.D.
Marks, G. C.	Nutrition	McCulloch	M.S./Ph.D.
Marsh, L. S.	Agric. Engineering	McCulloch	Ph.D.
Rafferty, A. P.	Nutrition	Schwager	Ph.D.
Robinson, J. A. B.	Animal Science	McCulloch	Ph.D.
Winichagoon, P.	Int'l Nutrition	Schwager	Ph.D.

Additional graduate minors in 1985–86

Name	Major Field	Minor Professor	Degree
Bailey, E.	Agric. Economics	Casella	Ph.D.
Burke, J.	Accounting-Business	McCulloch	Ph.D.
Cacela, D. A.	Natural Resources	Robson	M.S./Ph.D.
Carabano, M.	Animal Breeding	Casella	M.S.
Carroll, M.	Floriculture	McCulloch	Ph.D.
Davidson, D. B.	Floriculture	Federer	Ph.D.
DeVeer, J. C.	Animal Breeding	Searle	Ph.D.
Ducrocq, V. P.	Animal Science	Casella	Ph.D.
Esrey, S. A.	Int'l. Nutrition	Casella	Ph.D.
Garrick, D. J.	Animal Science	Searle	Ph.D.
George, S.	Int'l Nutrition	Schwager	Ph.D.
Hudson, B. D.	Plant Pathology	McCulloch	M.S./Ph.D.
Lutter, C. K.	Nutritional Sciences	Robson	Ph.D.
Lynch, D. J.	Food Science & Tech.	Schwager	Ph.D.
Mantysaari, E.	Animal Breeding	Casella	Ph.D.
Osmond, D. L.	Agronomy	Casella	Ph.D.
Schukken, Y. H.	Veterinary Medicine	Schwager	M.S.
Wray, N. R.	Animal Science	McCulloch	M.S.

Additional graduate minors in 1986–87

Name	Major Field	Minor Professor	Degree
Bailey, E.	Agric. Economics	Casella	Ph.D.
Berge, P.	Nutritional Science	Federer	Ph.D.
Bergeron, S. N.	Plant Pathology	Casella	M.S./Ph.D.
Bicamumpaka, M.	Plant Breeding	Federer	M.S./Ph.D.
Boggess, J. D.	Consumer Ec. & Housing	McCulloch	M.S./Ph.D.
Bollinger, E. K.	Natural Resources	Robson	Ph.D.
Braner, M.	Ecology & Systematics	McCulloch	Ph.D.
Cossio, T.	Nutrition	Casella	Ph.D.
Delserone, L. M.	Plant Pathology	Casella	Ph.D.
Francis, J.	Bus. & Public Admin	McCulloch	Ph.D.
Kendall, A. E.	Nutrition	Casella	Ph.D.
Liu, Y.	Animal Science	Federer	M.S./Ph.D.
Lloyd, R. C.	Natural Resources	Casella	Ph.D.
Munkenbeck, N. W.	Animal Science	Robson	Ph.D.
Potischman, N. A.	Nutrition	McCulloch	Ph.D.
Samelson, D.	Agronomy-Meteorology	McCulloch	M.S.
Short, T. H.	Animal Breeding	Searle	Ph.D.

Additional graduate minors in 1987–88

Name	Major Field	Minor Professor	Degree
Burnquist, W.	Plant Breeding	Federer	Ph.D.
Desikachar, P.	Management	McCulloch	Ph.D.
Elrod, D. R.	Psychology	Schwager	Ph.D.
Kurz, K.	Nutrition	Schwager	Ph.D.
Lee, C.	Management	Casella	Ph.D.
Meenakshi, J.	Agric. Economics	Casella	Ph.D.
Schroeder, C.	Food Sci. & Tech.	Altman	Ph.D.
Troiano, R.	Nutrition	Casella	Ph.D.

Table 8. Courses Taught by Biometrics Unit Personnel and Class Sizes Part 1 (1948–64)

Acad. Yr. Enrollment & Fac.	48–	49–	50–	51–	52–	53–	54–	55–	56–	57–	58–	59–	60–	61–	62–	63–
	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
213 Advanced	x	33	39	33	27											
Stats. Methods I	WF	WF	WF	WF	WF											
214 Advanced Statistical		18	20	22	4											
Methods II		WF	WF	WF	WF											
210 Statistical						145	70	81	90	90	86	101	76	64	98	88
Methods I						RS	RS	RS	RS	RS	WF	RS	DR	KT	DR	KC
210a Statistical						30	12	15	27	26	22	29	17	23	33	30
Methods Algebra I						RS	RS	RS	RS	RS	DR	RS	DR	TB	TB	SM
211 Statistical						43	43	45	53	45	40	47	36	46	52	31
Methods II						RS	RS	RS	RS	RS	WF	RS	DR	KT	KC	KC
211a Statistical							6	7	16	14	10	14	9	18	17	18
Methods Algebra							RS	RS	RS	RS	DR	RS	DR	AD	TB	SM
213 Design of						11	7	16	20	16	21	15	8	15		22
Experiments II						WF	EH	WF	WF	WF	WF	WF	WF	WF		WF
214 Design of						6		12	10	13	10	9	4	12		13
Experiments II						WF		WF	WF	WF	WF	WF	WF	WF		WF
219 Statistical								X	11			12				11
Genetics								DR	DR			DR				DR
219 Advanced Biometrical										24						
Methods										DR						
219 Linear															X	
Models															KB	
410 Mathematical and Stat-																8
istical Models in Biology																KC
150 Linear																1
Programming																WF
150 Quality																3
Control																WF

Table 8. Courses Taught by Biometrics Unit Personnel and Class Sizes Part 2 (1963–76)

Acad. Yr. Enrollment & Fac.	63–	64–	65–	66–	67–	68–	69–	70–	71–	72–	73–	74–	75–
	64	65	66	67	68	69	70	71	72	73	74	75	76
150 Design of Experiments	3												
	WF												
213 Computer Programming	16												
	SS												
214 Computer Programming	14												
	SS												
408 Statistical Analysis		23	11	12	27	14	26	31	35	36	40	26	42
I (Probability)		LR	YW	YW	JJ	DS	DS	DS	DS	DS	DS	DA	DS
408 Computer Programming		26	23										
		SS	SS										
409 Statistical Analysis II		11	6	6	3	12	12	11	20	19	27	6	26
(Estimation, Distributions)		LR	YW	YW	JJ	DS	DS	DS	DS	DS	DS	DA	DS
409 Computer Programming		12											
		SS											
510 Statistical Methods I		73	80	123	138	169	175	135	147	118	140	116	102
		LB	SU	SU	SU	SU	SU	WS	RD	RD	CW	CW	CW
511 Statistical Methods II		39	57	87	87	89	145	130	76	72	84		
		LB	SU	SU	SU	SU	SU	WS	RD	RD	CW		
513 Design of Experiments I		18		24	10	19		12		15		15	12
		WF		WF	WF	WF		WF		WF		WF	WF
514 Design of Experiments II		19		18		12		9		7		12	5
		WF		WF		WF		AH		WF		WF	WF
518 Sequential Sampling,		8			4			10	2	12			
Bioassay, Nonparametric		DR			DR			DR	DR	DR			
200 Data Collection			77	109	99	84	62	90	98	145*	162*	140*	93*
and Interpretation			WF	WF	WF	LR	CM	WF	FC	FC	FCWF	FC	WF
519 Statistical Genetics				5									
				DR									
411 Statistical Methods			5										16
			KC										DS
410 Mathematical			19	18									
Models			KCDR	DR									
417 Matrix Algebra			20	15	16		21		24	26	41	14	18
			SS	SS	SS		SS		SS	SS	SS	SS	JM
517 Linear Models			11		9						4	31	
			SSDR		SS						SS	SS	
407 Computer Usage				29	28	26	15	14	22			9	
				SS	SS	JR	SS	SS	SS			DA	
499 Special Problems in						5	10		12	16	16		
Statistics and Biometry						WFDS	DS		CDS	SS	FC		
520 Design of Experiments III									4				
									FHR				
521 Design of Experiments IV									4				
									FHR				
502 Design Analysis I												67	41
												CW	CW

503 Design Analysis II												44	26
												CW	CW
504 Regression Analysis I												53	30
												CW	FC
505 Regression Analysis II												25	17
												FC	FC
506 Sampling Biological												26	
Populations												DR	
507 Distribution Free												22	21
Methods												CW	CW
519 Multivariate Calculus												11	
												SS	

Table 8. Courses Taught by Biometrics Unit Personnel and Class Sizes Part 3 (1976–88)

Year Enrollment & Fac.	76–	77–	78–	79–	80–	81–	82–	83–	84–	85–	86–	87–
	77	78	79	80	81	82	83	84	85	86	87	88
200 Statistics and the	41	89*	60	60	71	56	85	66	86	105	83	59
World We Live In	DS	WF	WF	WF	WF	WF	GC	JS	JS	WF	CM	JS
408 Probability and	32	28	24	43	41	18	32	32	36	37	41	34
Statistics I	DR	DR	JS	JS	JS	JS	JS	GC	GC	JS	MM	JS
409 Probability and	26	21	9	29	38	18	23	23	22	31	31	22
Statistics II	DS	RH	JS	JS	JS	JS	CM	GC	CM	CM	GC	MM
411 Stochastic Models	3											
in Biology	DS											
416 Matrix Algebra I	42	48	42	66	47	38	36	59	45	49	45	
	SS	SS	SS	SS	SS	SS	CB	SS	SS	SS	SS	
417 Matrix Algebra II	36	20	25	26	31	25	26	34	36	41	36	36
	SS	SS	SS	SS	SS	SS	CB	CB	SS	SS	SS	SS
601 Statistical	101	150	201	268	298	211	225	258	264	235	198	234
Methods I	FC	DSRH	DS	DS	DS	GC	CM	CMMM	CMMM	GCMM	GC	CM
602 Design and Analysis I	53	66										
	CW	RH										
603 Design and Analysis II	18											
	CW											
604 Regression Analysis I	49	65										
	FC	SS										
605 Regression Analysis II	28		13				13				18	
	FC		FC				GC				CM	
606 Sampling Biological	8		11		11		12		13		32	
Populations	DR		DR		DR		DR		DR		DR	
607 Nonparametric and	22	42		78		25		55		61		78
Distribution Free Methods	CW	DS		DS		GC		CM		CM		CM
717 Linear Models	12	10	9		25			22		12		14
	SS	DR	SS		SS			SS		SS		SS
720 Statistical Design	5											
	WF											
699 Variance Component		9				17			8		8	
Estimates		SS				SS			SS		SS	
719 Multivariate		7										
Analysis		SS				7	3					
602 Statistical Methods II			68	70	76	51	71	62	100	96	99	100
			FC	FC	FC	FC	FCMM	FCMM	MM	FCMM	MM	NA

714 Treatment Design and Related Experiment Designs			6		9		7		4			
			WF		WF		WF		WF			
612 Mathematical Ecology			40		29		9		24		11	
			DSSL		DSSL		CMSL		CMSL		CMSL	
701 Advanced Biometry			11				12		3		5	
			DR				DR		DR		DR	
713 Experiment Design				14		23		13		12		
				WF		WF		WF		WF		
799 Statistical Consulting				18*	3	16*	14*	9*	6*	8*	11*	9*
				DR	DR	DR	DRJS	JSDR	JS	DR	DR	JS
699 Interpretation of Computer Output				40								
				SS								
699 Design and Analysis of Intercrop Experiments							24		2	5		
							WF		WF	WF		
603 Statistical Methods III									20	14	13	20
									G	G	G	BT
215 Introduction to Statistical Methods												56
												MM
699 Mixture Models; Geometry and Methods												6
												BL

List of Special Courses Offered by Staff

1948–49	Least Squares Theory	WF
	Variance Component Analysis	WF
	Design of Experiments	WF
1953–54	Design and Analysis of Experiments	WF
1954–55	Sampling and Sample Survey	E. E. Houseman
1955–56	Statistical Genetics	DR
1955–56	Matrix Algebra	KT
1956–57	Matrix Algebra	SS
1960–61	Fish Population Dynamics	DR
1962–63	Arithmetic of Matrices	SS
1963–64	Computer Programming	SS
1964–65	Stochastic Processes in Biology	DR & KC
1968–69	Methods of Constructing Mutually Orthogonal Latin Squares	WF, AH, LR, Seiden, Parker, Turyn
1972–73	Classical Papers in Statistics	Staff
1975–76	Unsolved Problems In Statistics	WF
1979–80	Faculty Short Courses (3) on Introductory Statistical Methods	DS
1980–81	Time Series Analysis	S. Schwager
1982–83	Errors in Variables and Related Topics	MM and CB

***Key for the previous table:**

AD	Alan Douglas
AH	Abdossamad Hedayat
BL	Bruce Lindsay
BT	Bruce Turnbull
CB	Calvin Berry
CM	Carl Marshall
CM	Charles McCulloch
CW	Constance Wood
DA	David Allen
DR	Douglas Robson
DS	Daniel Solomon
EH	Earl Houseman
FC	Foster Cady
FHR	Federer, Hedayat, Raktoe
G	Clark, Federer, Robson, Santner, Schwager, Turnbull
GC	George Casella
JJ	James Joiner
JM	John Mandeli
JR	John Rudan
JS	Steven J. Schwager
KB	Kali Banerjee
KC	Keewhan Choi
KT	Keith Thompson
LB	Leslie Balaam
LR	B. Leo Raktoe
MM	Michael Meredith
NA	Naomi Altman
RH	Robert Hultquist
RS	Robert Steel
SL	Simon Levin
SM	Sati Mazumdar
SS	Shayle Searle
SU	N. Scott Urquhart
TB	Thomas Beetle
WF	Walter Federer
WS	William Swallow
YW	Ying Wang

5. THE RESEARCH OF THE BIOMETRICS UNIT

The research efforts of the Biometrics Unit have been chiefly financed from grants, agreements, and contracts from the beginning. These have been obtained from federal or commercial organizations. It should be noted that Hatch funds are allocated by the College of Agriculture and Life Sciences (CALS). These funds have been made available as “seed money” and as monies to get a nonfunded project started. The monetary amounts were relatively small compared to the other sources of funds. Since CALS wished to have all research under projects, some Hatch projects had zero funds. A list of grants, agreements, and contracts obtained for research in the Biometrics Unit is given below:

1. Research and Marketing 9b1-2, Project 68 and Project 28 of Department of Agricultural Economics, CALS, 1950–54
Title: An Investigation of Methods of Sampling and Estimating Characteristics of Human and Biological Populations
Principal Investigator: W. T. Federer
Co-Investigators: D. S. Robson, Howard E. Conklin, Quentin M. West, Edward O. Moe
Description: See 2nd to 6th Annual Reports
2. A. J. King - National Analysts, Inc., 1951–54
Title: Analyses of Surveys and Investigation of Various Sampling Procedures
Principal Investigators: W. T. Federer, D. S. Robson
Co-Investigators: Arnold J. King, Robert K. McMillan, J. Edward Dowd
Description: See 3rd to 6th Annual Reports
3. School of Nutrition, Cornell University, 1953–55
Title: Grant to Biometrics Unit for Statistical Consulting
Principal Investigators: R. G. D. Steel, D. S. Robson
Description: See 6th and 7th Annual Reports
4. Cooperative Agreement Between New York State College of Agriculture and the Conservation Service, USDA, Contract No. 12-10-001-93, 1956–66
Title: Drawing Representative Samples of Land for Determining Conservation Needs
Principal Investigators: W. T. Federer, J. E. Dowd, Janet C. Cassady, Thomas M. Beetle
Description: See 9th to 18th Annual Reports
5. Hatch Amended 125, CALS, 1954–56
Title: An Investigation of Methods of Sampling and Estimating Characteristics of Human and Biological Populations. A comparison of several methods of estimating the total dry matter yield of corn plots using the green and dry matter weight of a sample and green weight of plots
Principal Investigator: D. S. Robson
Description: See 6th and 7th Annual Reports
6. Hatch 424, CALS, 1956–67
Title: Statistical Methods of Quantitative Genetics
Principal Investigator: D. S. Robson
Description: See 9th to 19th Annual Reports
7. Hatch 425, CALS, 1956–67
Title: Genetic Experiments on Primitive Organisms
Principal Investigators: W. T. Federer, Adrian M. Srb, Kenneth E. Papa
Description: See 9th to 19th Annual Reports

8. National Institutes of Health Research Grant, PHS-GM-05900, 1958–74
Title: Biometry of Disease
Principal Investigator: W. T. Federer
Description: See 11th to 26th Annual Reports
9. National Science Foundation Research Grant, GB-402, 1959–71
Title: Cumulant Component Analysis
Principal Investigator: D. S. Robson
Description: See 11th to 23rd Annual Reports
10. Office of Naval Research Grant, Contract NONR-40K39), 1959–64
Principal Investigator: W. T. Federer
Co-Investigators: D. S. Robson, A. M. Srb, Bruce Wallace
Description: See 12th to 16th Annual Reports
11. Public Health Training Grant, GM-392, 1960–76
Title: General Research Training Grant
Program Director: W. T. Federer
Description: See 12th to 28th Annual Reports
12. National Institute of Health Research Grant, PHS-GM-13225, 1965–68
Title: Properties of Variance Component Estimation
Principal Investigator: S. R. Searle
Description: See 18th-20th Annual Reports
13. Hatch 401, CALS, 1968–79
Title: Statistics and Biometry
Leaders: Biometrics Unit Faculty
Description: See 20th to 31st Annual Reports
14. National Science Foundation Research Grant, GJ-31746, 1972–75
Title: Variance Component Estimation
Principal Investigator: S. R. Searle
Description: See 24th to 27th Annual Reports
15. U. S. Department of Interior Research Grant, 14-16-0008-664, 1972–75
Title: Estimation of Annual Mortality Rates from Waterfowl Banding Records
Principal Investigator: D. S. Robson
Description: See 24th to 27th Annual Reports
16. Food and Drug Administration Research Contract, FDA-73-235, 1973–75
Title: Development of a Reference Manual for Statistical Analysis and Interpretation of Dose Response Relationships
Principal Investigator: D. S. Robson
Description: See 26th and 27th Annual Reports
17. Hatch Project NYC-151402, CALS, 1975–77
Title: Statistical Analysis of Assumed Biological Models
Principal Investigator: Constance L. Wood
Description: See 28th and 29th Annual Reports

18. Hatch Project NYC-151455, CALS, 1976–79
Title: Properties of New Methods of Estimating Variance Components and Applications to Animal Breeding
Principal Investigators: S. R. Searle, Richard L. Quaas
Description: See 29th to 31st Annual Reports
19. Hatch Project NYC-151463, CALS, 1977–79
Title: Methods for Validation of the Removal-Sampling Technique for Estimating Population Density.
Principal Investigators: D. S. Robson, J. R. Georgi, John R. Skalski
Description: See 30th and 31st Annual Reports
20. Hatch Project NYC-151401, CALS, 1978–present
Title: Statistical Designs and Analyses for Mixed Cropping Systems and Mixtures of Compounds
Principal Investigator: W. T. Federer
Description: See 31st to 40th Annual Reports
21. Hatch Project NYC-151403, 1978–present
Title: Statistics and Biometry
Investigators: Biometrics Unit Faculty
Description: See 31st to 40th Annual Reports
22. Pine Vole Cooperation Agreement, Ohio Cooperative Wildlife Research Unit, 1979–81
Title: A Sampling Plan for Estimating Fruit Tree Damage Caused by Pine Voles
Principal Investigators: D. S. Robson, Jonathan Bart
Description: See 32nd and 33rd Annual Reports
23. National Institutes of Health Contract, C-0094, 1979–81 (Project continued until present time on other funds)
Title: Annotated Computer Output (ACO) Project
Principal Investigator: S. R. Searle
Description: See 32nd to 40th Annual Reports
24. Hatch Project NYC-151405, CALS, 1980–84
Title: Statistical Methods for Multivariate Outliers
Principal Investigator: S. J. Schwager
Description: See 33rd to 36th Annual Reports
25. National Science Foundation MCS81-02541, 1980–82
Title: Improved Estimation in Linear Models
Principal Investigator: G. C. Casella
Description: See 33rd and 34th Annual Reports
26. National Science Foundation MCS 79-05771, 1981–82
Title: Biased Estimation in Linear Models
Principal Investigator: G. C. Casella
Description: See 34th Annual Report
27. Hatch Project NYC-151406, CALS, 1982–86
Title: Statistical Investigations of Correspondence Analysis
Principal Investigator: C. E. McCulloch
Description: See 35th to 38th Annual Reports

28. National Science Foundation Project, MSC-8300875, 1982–84
Title: Improved Confidence Procedures—Theory and Applications
Principal Investigator: G. C. Casella
Description: See 35th and 36th Annual Reports
29. Batelle Pacific Northwest Laboratories Contract No. B-D7987-A-H, 1983–86
Title: Design and Analysis of Wildlife Experiments Using Tag-Recapture Data
Principal Investigators: D. S. Robson, J. R. Skalski
Description: See 36th to 38th Annual Reports
30. Hatch Project NYC-151407, CALS, 1984–present
Title: Statistical Methods for Orthogonal Experiment Designs
Principal Investigator: S. J. Schwager
Description: See 37th to 40th Annual Reports
31. National Science Foundation Project MCS-81-02541 and MCS-81-01973, 1984–present
Title: Statistical Confidence Statements
Principal Investigator: G. C. Casella
Description: See 37th to 40th Annual Reports
32. EZRA Project, CALS, 1984–present
Title: Integrating Microcomputers in Statistical Methods Instruction
Director: C. E. McCulloch
Description: See 37th to 40th Annual Reports
33. Hatch Project NYC-151402, CALS, 1986–present
Title: Empirical Bayes Data Analyses
Principal Investigator: G. C. Casella
Description: See 39th and 40th Annual Reports
34. Hatch Project NYC-151406, CALS, 1986–present
Title: Statistical Investigation of Discrete Data Analysis
Principal Investigator: C. E. McCulloch
Description: See 39th and 40th Annual Reports
35. American Institute for Cancer Research, 1986–present
Title: The Nutritional Prevention of Non-Melanoma Skin Cancer
Principal Investigator: L. C. Clark
Description: See 39th and 40th Annual Reports
36. American Cancer Society Project, 1986–present
Title: The Nutritional Prevention of Squamous Cell Carcinoma
Principal Investigator: L. C. Clark
Description: See 39th and 40th Annual Reports
37. Hatch Project NYC-151408, CALS, 1987–present
Title: Statistical Evaluation of Analysis of Variance Computing Packages:
Annotated Computer Output (ACO)
Principal Investigator: S. R. Searle
Description: See 40th Annual Report
38. Hatch Project NYC-151410, CALS, 1987–present
Title: Semi-parametric Techniques for Time and Spatially Related Data

Principal Investigator: Naomi S. Altaian
 Description: See 40th Annual Report

In addition to the above, there have been several small grants to Fellows, Visitors, graduate students, or faculty over the years. Also support from other units at Cornell has aided the Unit's programs. The College of Veterinary Medicine in the past and the Boyce Thompson Research Institute at present are two such examples. The latter, for example, has supported graduate students for several years. Support from the above sources has allowed the graduate program to expand over the years. The NIH Training Grant, for example, allowed the Unit to essentially double the number of graduate students it could support.

The largest grants per year were numbers 35 and 36 under the direction of L. C. Clark. The grants that had the greatest impact on the nature and direction of the Biometrics Unit by far were numbers 8 and 11. The former NIH Research Grant PHS-GM-05900 was awarded for a total of 17 years. The long duration of this grant and its magnitude allowed support of numerous visiting Fellows and scientists (see Tables 2 and 3). Most of the grants were for five-year periods, which allowed planning for longer-term research projects and personnel. To illustrate the effectiveness of this project, the reader is referred to the 26th Annual Report, pages 41 to 53. Some idea of the extent and nature of research may be obtained from the following table. The quantity and place of publication for the five-year period preceding August 1974 and for six areas of research are given below:

Area of Research (Number of Papers)*

Publication In	TD	ED	FW	DIS	DDC	OTH	Total
Annals Math. Stat.	11	7					18
Annals Inst. Stat. Math	4	1					5
Biometrics		3	1			8	12
Biometrika	1	2				1	4
Chapters in Books	4	3	1			2	10
American Statistical Assoc.						3	3
Combinatorial Theory		2				1	3
J. Roy. Stat. Soc. B		1				2	3
Other Stat. Journals	4	8				4	16
Journals in Other fields	1	1	10	6	4	6	28
Total	25	28	12	6	4	27	102

* TD Treatment design (selection or design of treatments included in an experiment)
 ED Experiment design (the arrangement of treatments in an experiment)
 FW Statistics and statistical procedures related to fishery and wildlife investigations
 DIS Mathematical-statistical studies associated with data collected on the disease haemonchosis in sheep
 DDC Mathematical-statistical studies of diseases in dogs and cattle
 OTH Other topics in statistics not included above

In addition, four books were published during this five-year period. Such productivity and diversity of publications attests to the superb quality of Visitors and Faculty supported under this grant. Numerous articles were published after this period. Probably no other NIH Research Grant with the funding level of GM-05900 can boast of this level of productivity per dollar spent for a five-year period. This level was attained by hiring mostly summer visitors. The visitors not only spent the summer but also the following year on the research started. For repeat or joint authors, this added to the number of publications of research partially or wholly supported under the Grant.

For the 40-year period, the following table gives the number of technical reports by decade for six areas of research:

Year of Start of Decade				
Research Subject	1948	1958	1968	1978
Statistical design	35	24	91	74
Statistical genetics	8	22	12	7
Computational statistics	14	7	22	38
Sampling biological population and stochastic processes	4	22	48	64
Regression and multivariate	19	32	73	106
Others	28	45	65	66

The trends in the above table indicate changes in research emphasis and support for the various areas. The cumulative production of technical reports, published papers, and theses is depicted in Figure 1. The effect of the NIH and other research grants may be noted from the change in slope of the curves about 1963.

The original goal of the Policy Committee was to have individuals highly trained in Statistics but with a solid foundation in the agricultural and biological sciences. A study of Table 9 and Figure 2 should confirm that their goal has been admirably fulfilled. The Faculty of the Unit has published in both mathematical and applied categories, with a sizeable number of papers in the most mathematical journals. They have also published numerous articles in journals concentrating on agricultural science (38), medical sciences (32), biological science (62), and animal science (29). It should be noted that some publications were missed because they did not appear in the Annual Reports. Most of these would be in agricultural, biological, medical, and animal publications. Publications in these four fields account for 34% of the publications of the Faculty. The Faculty has had and has the ability to write in purely mathematical and theoretical statistics journals as well as for applications of statistical procedures and theory. This is considered to be a commendable trait of the Faculty. It should be pointed out that new statistical theory may be found frequently in the publications with applications.

Three areas of research are being singled out to discuss. Each faculty usually works in several areas of Statistics. The three long-termers, Federer, Robson, and Searle, have each become internationally recognized for their theoretical contributions in specific areas. Federer has constructed or been involved in the construction and characterization of several classes of experiment and treatment designs and in statistical analyses (including covariance) for experiments. Robson has made significant and notable contributions in statistical genetics and in sampling and estimation for fisheries and for wildlife populations; he is especially well known for his mark-recapture and nonadditivity work; he has also contributed significantly to animal medical science. Searle is famous for his contributions to variance component estimation and linear model theory. Their productivity and creativity have continued for the entire period of their association with the Unit. For a detailed description of the research of the Unit, reference is made to the 40 Annual Reports. The current Faculty are in the process of making their claims to fame.

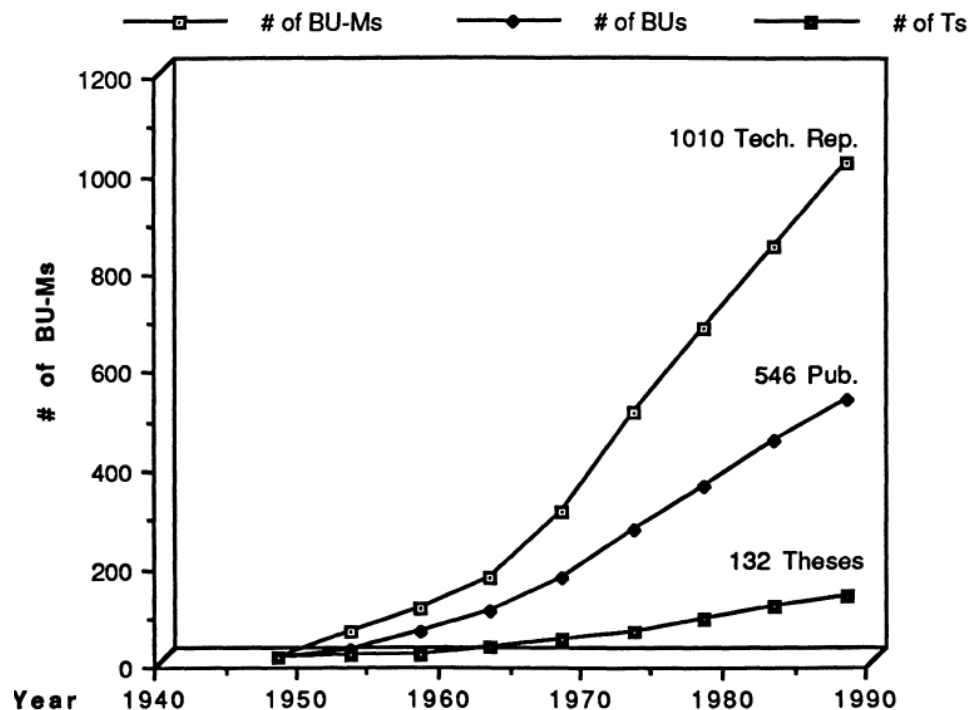


Figure 1. Cumulative Number of Technical Reports, Published Papers, and Theses by 5-year Periods.

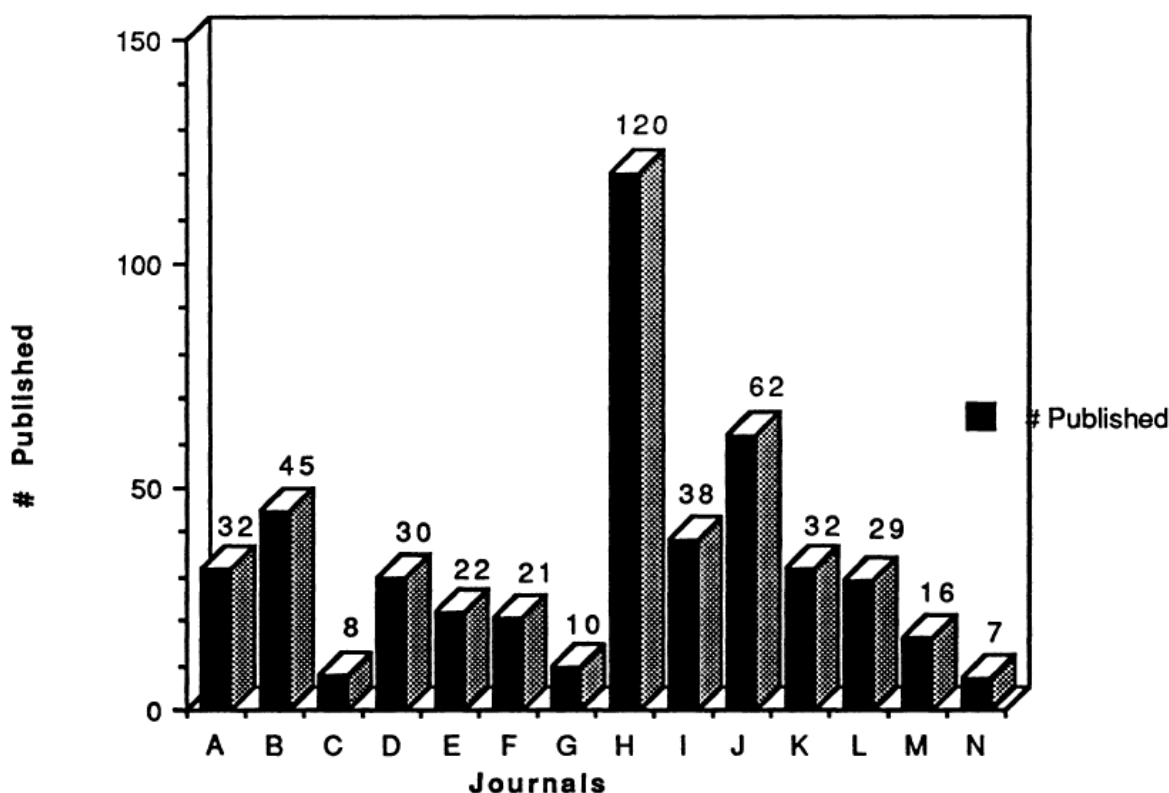


Figure 2. Number of Publications by Journal.

JOURNAL KEY:

A = Annals of Statistics

B = Biometrics

C = Biometrika

D = Communications in Statistics

E = Journal of the American Statistical Association

F =

F = American Statistician

G = JRSS,B

H = Other statistical publications

I = Animal science journals

J = Biological science journals

K = Medical science journals

L = Dairy science journals

M = Special publications

N = Mathematical journals

**Table 9. Papers Published by Tenure Track Faculty in the Biometrics Unit
for More Than Two Years, 1948–88***

Member	AN	BC	BK	CS	JA	AM	RS	OS	AS	BS	SP	MS	DS	MA
Federer, W. T. 1948–88	20	16	4	7	4	2	5	62	25	7	10	1		6
Robson, D. S. 1949–88	1	11	1	8	5			5	1	41	3	29	1	
Steel, R. G. D. 1952–60	1	2			1			2		1		2	2	
Choi, K. 1960–66							1							
Searle, S. R. 1962–88	4	13		6	1	12	3	29	2	3	1		25	
Urquhart, N. S. 1965–70				1		1		2	1	1	1			
Solomon, D. L. 1968–81		1	1	1	2	1	1	1	2					
Cady, F. B. 1971–86		1						1	5					
Wood, C. L. 1973–77	1	1	2	1	1				1					
Schwager, S. J. 1978–88	1			1	1	2		5	1	2	1		1	
Casella, G. C. 1981–88	4			1	5	2		6		1				
McCulloch, C. E. 1982–88				4	2	1		7		6				1
TOTALS	32	45	8	30	22	21	10	120	38	62	16	32	29	7

*Journal title abbreviations:

AN	Annals of Mathematical Statistics or Annals of Statistics
BC	Biometrics
BK	Biometrika
CS	Communications in Statistics
JA	Journal of the American Statistical Association
AM	The American Statistician
RS	Journal of the Royal Statistics Society, Series A,B, and C (Applied Statistics)
OS	Other statistical publications
AS	Agricultural science publications
BS	Biological science publications
MS	Medical science publications
SP	Special publications (memoirs, research bulletins, etc.)
DS	Dairy and animal science publications
MA	Mathematical journals

Faculty, Fellows, and Visitors of the Unit have authored or coauthored the following books and monographs:

- B-1. Federer, W. T. (1955). *Experimental Design—Theory and Application*, Macmillan Co., New York, xix+546+47pp. (1st printing 1955, 2nd printing 1962) (Republished by Oxford and IBH Publishing Company, New Delhi, Bombay, Calcutta, 1st printing 1967, 2nd printing 1974).
- B-2. Steel, R. G. D. and J. H. Torrie (1960). *Principles and Procedures of Statistics*, McGraw-Hill Book Co., New York, 481 pp. (second edition in 1980).
- B-3. Searle, S. R. (1966). *Matrix Algebra for the Biological Sciences, Including Applications in Statistics*. John Wiley and Sons, Inc., New York, 296 pp.
- B-4. Searle, S. R. and W. H. Hausman (1970). *Matrix Algebra for Business and Economics*, John Wiley and Sons, Inc. New York xii+362 pp.
- B-5. Searle, S. R. (1971). *Linear Models*, John Wiley and Sons, Inc., New York
- B-6. Federer, W. T. (1973). *Statistics and Society*, Volume 3 in *Statistics Textbooks and Monographs*, Marcel Dekker, Inc., New York, ix+397 pp.
- B-7. Federer, W. T. (1973). *Statistics and Society Supplement*, Marcel Dekker, Inc., New York, iv+155 pp.
- B-8. Federer, W. T. and L. N. Balaam (1973). *Bibliography on Experiment and Treatment Design Pre-1968*. Published for the International Statistical Institute by Oliver and Boyd, Edinburgh, 769 pp.
- B-9. Poole, R. W. (1974). *An Introduction to Quantitative Ecology*, McGraw-Hill, Inc., New York, xii+532 pp.
- B-10. Rollins, R. C. ,...,W. T. Federer, et al. (1977). *Guayale: An Alternate Source of Natural Rubber*. National Academy of Sciences, Washington, D.C., xi+80 pp.
- B-11. Solomon, D. L. and C. Walter (Editors) (1977). *Mathematical Models in Biological Discovery*, Volume 13 in *Lecture Notes in Biomathematics*. Springer-Verlag, Berlin, vii+240 pp.
- B-12. Brownie, C, D. R. Anderson, K. P. Burnham, and D. S. Robson (1978). *Statistical Inference from Band Recovery Data—A Hand Book*. U.S. Dept. of Interior, Fish and Wildlife Service, Resource Publication No. 131, Washington, D.C., 212 pp.
- B-13. Cormack, R. C., G. P. Patel, and D. S. Robson (Editors) (1979). *Sampling Biological Populations*, Statistical Ecology Series, Volume 5, International Cooperative Publishing House, Burtonsville, Maryland.
- B-14. Van Vleck, L. D. and S. R. Searle (1979). *Variance Components and Animal Breeding*, Proc., Conference in Honor of C. R. Henderson, July 16-17, 1979, Biometrics Unit, Cornell University, Ithaca, New York.
- B-15. Raktoe, B. L., A. Hedayat, and W. T. Federer (1981). *Factorial Designs, On Probability and Mathematical Statistics Series*, John Wiley and Sons, Inc., New York, xii+299 pp.
- B-16. Federer, W. T. (1982). *Delineamento O Analise Estatistica de Experimentos de Consorciacao de Culturas*, Tech. Report DMQ/B/21, EMBRAPA, Brasilia, D.F., Brasil, 195 pp.
- B-17. Gilford, D. M., G. L. Nelson, L. Ingran, and National Research Council Panel on Statistics for Rural Development (J. T. Bonnen, W. T. Federer, et al). 1981. *Rural America in Passage: Statistics for Policy*, National Academy Press, Washington, D.C., ix+592 pp.
- B-18. Searle, S. R. (1982). *Matrix Algebra Useful for Statistics*, John Wiley and Sons, Inc., xxii+438 pp.

- B-19. McCulloch, C. E., S. J. Schwager, G. C. Casella and S. R. Searle (1986). Statistical Design: Theory and Practice. Proceedings of a Conference in Honor of Walter T. Federer, Biometrics Unit, Cornell University, Ithaca, New York, ix+231 pp.
- B-20. Searle, S. R. (1987). Linear Models for Unbalanced Data (volume in the Wiley Series in Probability and Statistics), John Wiley and Sons, Inc., New York, xxiv+536 pp.
- B-21. Casella G. C. and R. L. Berger (1989). Statistical Inference, Wadsworth/Brooks Cole.

In addition to the above, several special issues of journals or other publications have been edited or authored by members of the Biometrics Unit.

6. THE CONSULTING ACTIVITIES OF THE BIOMETRICS UNIT

Statistical consulting with graduate students and faculty from all areas of Cornell University has been a sizeable part of the Unit's activities from the beginning. Most consultees are from the CALS, College of Human Ecology, School of Nutrition, College of Veterinary Medicine, and Boyce Thompson Research Institute. Originally in 1948–49, an open door policy for statistical consulting was in operation. Since the entire day was often taken up for both Federer and Robson, a policy of making appointments was instituted. This reduced the consulting load to one-third or one-half of the previous amount. Evidently, when no appointment was necessary, individuals did not fully think out their questions. Given more time to think about their questions, individuals may have answered their own questions, or they may have needed less time for consultation.

The author was told in writing that he would have one-half time for research and the other half would be for teaching and consulting. He didn't know that the half time for research meant evenings (if he didn't answer consulting problems over the phone) and weekends! Over the years, the statistical consulting load has reached manageable proportions owing to constant adherence by Faculty to committing a fixed number of hours per week to this activity. There are times when a faculty member devotes a couple of days or weeks rather than a fixed number of hours for consulting, but in general a fixed number of hours (two to four) per week per faculty member, are allocated.

Since graduate majors in Statistics and Biometry indicated that consulting was one of the most valuable experiences they received during their graduate training, a formalized system was devised in 1960–61 (See 13th Annual Report) whereby students were required to do statistical consulting as part of their training. They had performed statistical consulting before but not on a formal basis and not all students were involved. Since students often felt inexperienced, a pair of statistics graduate students would meet with the consultee. Statistical consulting was instituted as a requirement for anyone receiving funds from the Training Grant, but extended to all majors. Since the Program Director, W. T. Federer, was instructed by NIH to direct the program, a minimal set of requirements was instituted. Basically the requirements were the two statistical methods courses, the two design courses, Philip J. McCarthy's sampling course, two courses in mathematical statistics from the Mathematics department, later the linear models course, assisting with the statistical methods course to gain teaching experience, and participating in the statistical consulting program of the Unit. The Unit Faculty in the late 1960s objected to the setting of requirements for students for whom they were Chairmen of the Graduate Committee. Federer informed them that if their students were to be supported on the Training Grant, they would have to meet these minimal requirements. Students of theirs not on Training Grant funds were exempt from these requirements. Since NIH would have only one director for a training grant, the Unit Faculty had no other choice. The course requirement did not persist (now students usually do not receive advanced training in survey sampling, experiment design, treatment design, and all the areas of linear models), but the teaching and consulting experiences are still required for graduate majors in Statistics and Biometry.

In 1979–80 (See 32nd Annual Report), statistical consulting was put on a more formal basis under the direction of D. S. Robson. Putting his 30 years of experience to work, credit was given under the course name of Stat and Biom 799, Statistical Consulting. The students registered for credit would meet weekly to discuss the problems on which they had consulted during the week. This practice is in operation today. The value of statistical consulting experience to a student is that when they take a full-time position and are immediately faced with doing statistical consultations, they are able to do this with the full confidence given them by their consulting experiences at Cornell.

Some individuals may consider statistical consulting an onerous service task, but this writer takes a completely diametrical view. Statistical consulting is considered an opportunity rather than a chore. One benefit for a statistician is that it keeps him/her in the real world of experimentation and investigation. The statistician who stays in the world of *Annals of Statistics* and *Annals of Probability* and pretends that his/her domain is a mathematics department may be completely out of touch with investigators' statistical needs. This does not imply that the papers in these journals should not have been written, but it does imply that there is an enormous statistical world outside the scope covered in these journals. Also, most of the material published in these journals never gets into practice or teaching.

A second benefit that a statistician derives from statistical consulting is to find statistical ideas and problems that need to be researched. Most statistical consulting sessions bring forth unsolved statistical problems. One trouble is that a statistical consultant does not have the time and often the ability to resolve all such unsolved problems. Most statistical consultation offers approximations for the consultee's problem, and it is hoped that the approximations are good ones. One learns that rigor may be attained in the chalkboard world of the classroom but must be considerably relaxed in the real world of investigation.

A third benefit of statistical consulting is the opportunity for statisticians to extend the impact of Statistics on investigations and investigators. Often the statistical consultant is a coauthor of a paper. This advertises Statistics in other fields. Most departments of a college such as CALS have an extension division of their department which advertises their research efforts, teaching, and expertise. Statistical consulting performs this function for a department of Statistics. It is our extension service, and our clientele are usually limited to the people on campus as opposed to people in a state.

A fourth benefit of statistical consulting is the opportunity for a statistician to have a real and beneficial effect on research and investigations in all fields. We have the opportunity of increasing the quality of all research by helping with proper planning, appropriate statistical designs, appropriate statistical analyses, and appropriate inferences and interpretations. A statistician without consulting experience who first begins consulting is usually only a statistical consultant. As more experience is acquired the statistician can become more than a statistical consultant, that is, a research consultant. Most consulting sessions that the writer has been involved in have resulted in a change in the original research plans. Changes were made to obtain more information and to obtain this information more efficiently, or perhaps not do the proposed investigation at all.

The impact of statistical consulting on the research of CALS has been recognized by the Directors of Research, and the Unit has had their strong support. However, except for few years on a small Hatch Project, funds specifically for consulting, e.g., for students, secretaries, computing, etc., have ever been allocated to the Unit by CALS Administration. The funds are meshed in with research and teaching funds. This probably has been beneficial since having one professional person do all the consulting would be highly undesirable (as would be charging for statistical consulting). The entire faculty should be involved because of the benefits listed above and because no one person has the expertise of an entire faculty.

Between the writer and D. S. Robson, CALS has benefitted from 80 years of statistical consulting. D. S. Robson is considered to be a super consultant. One department head said in a meeting of a large CALS committee, "Every faculty member and graduate student in CALS should have the opportunity of consulting with Robson. His excellent concepts, ideas, and solutions are beyond belief and truly magnificent!" Such a statement demonstrates the impact that one statistical consultant can have. C. E. McCulloch says, Robson is the best statistical consultant he has ever encountered.

7. COMPUTING ACTIVITIES OF THE BIOMETRICS UNIT AND CAG

In general, members of the Biometrics Unit, except for S. R. Searle, have never been intimately concerned with macrocomputers and computing at Cornell. Several have served in an advisory and policy capacity over the years. In 1967, under the perseverance and guidance of Nyle C. Brady, Director of Research, and S. R. Searle, a Computer Activities Group (CAG) was established. CAG provided computing service for the four Statutory Colleges at Cornell. It operated a card reader-line printer connected to the Cornell Computing Center's IBM 360-65. Local access to the speed, versatility, and storage capacity of the large off-campus computer was made possible. Key punch facilities, operators, and a range of unit record machines for producing and manipulating decks of data or programs were made available. Also, programmers in CAG produced programs for general usage and were available to help individual users.

The first director hired was Errol Jones in 1968, he continued in this capacity until CAG was dismantled in 1978 under the direction of J. Robert Cooke, Director of Resident Instruction. CAG was placed in the Department of Plant Breeding as a third unit. Close cooperation existed between CAG and the Biometrics Unit. Errol Jones joined the staff of the Biometrics Unit in February 1979, where he continued activities in computing. In recent years, he has been directly involved with Agricultural Engineering. Under Jones's direction, many of the computer software packages such as SAS, GENSTAT, SPSS, etc., were put in a functioning and operating condition.

Except for a few times in the 1960s when computing courses were given by S. R. Searle, no formalized courses have been given by the Unit. Some instruction on the use of some software packages, such as SAS and MINTTAB, is included in Stat and Biom 200, 601, and 602. Computing per se has never been a thrust of the Unit. It has been considered only as a tool for doing statistical computations and occasionally to gain insight into statistical ideas and concepts. Computers have been used several times to check proposed or suspected mathematical results. If examples are confirmatory of ideas on the computer, then the investigator will attempt an analytic solution. Sometimes the computations even point out ways for obtaining a mathematical proof for a result.

8. OTHER ACTIVITIES OF THE FACULTY

Biometrics Unit faculty have been very much involved with professional and society activities over the years. They have served as program planners for professional meetings, officers in societies, editorial board members, editors, members of society committees, members of national committees on statistics, participants in meetings, and in many other activities. They have received several honors and awards for their professional achievements. A detailed description may be found in the 1st through 40th Annual Reports of the Biometrics Unit. A partial listing of activities and honors for the Faculty listed in Table 9 appears below:

Federer, W. T. (1948–88)

Positions in the Biometric Society

- 1950–53 Secretary, Biometric Society (ENAR)
- 1954–56 Member, Regional Committee, Biometric Society (ENAR)
- 1956–58 Member, Advisory Board, Biometric Society (ENAR)
- 1959 President Elect, Biometric Society (ENAR)
- 1960 President, Biometric Society (ENAR)
- 1961 Local Rep., Biometric Society (ENAR), Spring Meeting, Ithaca
- 1962–66 Council Member, Biometric Society (ENAR)
- 1964–72 Book Reviews Editor, Biometrics
- 1967, 1968 Member, Program Committee, Biometric Society (ENAR), Spring Meetings, Atlanta and Blacksburg
- 1972–76 Associate Editor, Biometrics
- 1977–79 Member, Biometric Society Awards Committee
- 1979 Chairman, Biometric Society Awards Committee
- 1981–82 Member, Organizing Committee, XIth International Biometric Conference, Toulouse, France

Professional Positions in Societies or Organizations

- 1953–56 Member, Panel of Consultants, Bureau of Agricultural Economics, USDA
- 1955–68 Member, IMS Subcommittee on Mathematical Tables on Studentized Range
- 1957–58 Reviewer, Mathematical Tables and Other Aids to Computation
- 1957–58 Reviewer, Mathematical Reviews
- 1959–61 Member, Council of the American Statistical Association
- 1960–65 Member, Committee on Association of Statistical Societies
- 1962 Member, ASA Nominations Committee
- 1965–72 Executive Secretary/Chairman, Committee of Presidents of Statistical Societies (COPSS)
- 1965 Program Chairman, Biometrics Section, ASA, Spring Statistics Meeting, Tallahassee (4/28-5/1)
- 1967 Member, IMS and Biometric Society (ENAR) Program Committee, Spring Statistical Meeting, Atlanta
- 1972–present Member, Editorial Board, Communications in Statistics
- 1973 Member, Organizing Committee, International Symposium on Statistical Design and Linear Models, Colorado State Univ., Ft. Collins (3/19-3/23)
- 1975 Panel on Guayule, National Research Council, National Academy of Sciences

- 1976–present International Board of Editors, U.S. Representative,
International Journal of Mathematics and Statistics, Brazil
- 1979–81 Panel on Statistics for Rural Development, National Research Council, National Academy of Sciences
- 1980–82 Board Member, Statistical Education, American Statistical Association (ASA)
- 1980–82 Budget Committee, ASA
- 1982 Chairman, Budget Committee, ASA
- 1982–85 Member, Committee on Theoretical and Applied Statistics (CATS), National Academy of Science
- 1983–84 Chairman, ASA ad hoc Committee on Policy on Gifts and Awards
- 1984–87 Member, AAAS Section U Electorate, Nominating Committee
- 1987 Chairman, AAAS Section U Electorate, Nominating Committee

Professional Honors

- 1958 Elected Fellow, American Statistical Association
- 1962 Elected Fellow, AAAS
- 1964 Elected Fellow, Royal Statistical Society
- 1967 Elected Fellow, Institute of Mathematical Statistics
- 1972 Honor Alumnus Achievement Award, Colorado State University
- 1974 Elected Member, International Statistical Institute (ISI) by its members
- 1978 Awarded, Liberty Hyde Bailey Professorship, Cornell University
- 1988 Awarded, Distinguished Service in Agriculture Award, Kansas State University

Robson, D. S. (1949–88)

Professional Positions in Societies and Organizations

- 1960–62 Member, Regional Advisory Board, Biometric Society (ENAR)
- 1960 Member, Program Committee, Biometric Society and Biometrics Section, ASA
- 1961 Member, Panel on Distemper and Hepatitis Vaccination,
53rd Annual Conference for Veterinarians, Ithaca, NY
- 1961 Program Chairman, Biometric Society (ENAR), Spring Statistics Meeting, Ithaca, NY
- 1964 Council Rep., Biometric Society (ENAR) and AAAS Council
- 1964 Member elect, Biometrics Section Committee, American Statistical Association
- 1964 Program Chairman, Symposium on Estimation of Biological Populations, AAAS, Montreal
- 1965 Program Chairman, Biometric Society (ENAR), Spring Meeting, Tallahassee, Fla.
- 1965 Program Chairman, Biometric Society, Council Representative, AAAS Meeting, Berkeley, Calif.
- 1965–67 Regional Committee Member, Biometric Society (ENAR)
- 1966 Program Chairman/Council Representative, AAAS Meeting, Washington, D.C.
- 1965–68 Associate Editor, Journal of the American Statistical Association
- 1967–68 Member, Council of the American Statistical Association
- 1968 Member, Program Committee, Spring Meeting, Biometric Society (ENAR)
- 1968 Member, National Academy of Sciences Work Conference on Education
in the Physical Sciences and Mathematics for Undergraduates in Agriculture and Natural Resources.
- 1969 President Elect, Biometric Society (ENAR)

- 1970 Member, ASA Council
- 1970 President, Biometric Society (ENAR)
- 1971–73 Member, Regional Committee, Biometric Society (ENAR)
- 1972–74 Council Member, International Biometric Society
- 1985–87 Member, Nominating Committee for Snedecor Award (ENAR) Professional Honors

Professional Honors

- 1964 Elected Fellow, AAAS
- 1966 Elected Fellow, American Statistical Association
- 1972 Elected Fellow, American Institute of Fishery Research Biology
- 1983 Corecipient (with Cavell Brownie), George W. Snedecor Award, ASA and ENAR

Searle, S. R. (1962–88)

Professional Positions in Societies and Organizations

- 1960–63 Reviewer, Mathematical Reviews
- 1967–71 Associate Editor, Biometrics
- 1967–69 Member, Regional Advisory Board, Biometric Society (ENAR)
- 1971–72 Member, Advisory Board, Egyptian Journal of Genetics and Cytology
- 1972–76 Associate Editor for Invited Papers, Biometrics
- 1973–75 Member, Regional Committee, Biometric Society (ENAR)
- 1974–76 Member, Committee on Information in Statistics, ASA and ENAR
- 1975–78 Council Member, International Biometric Society
- 1977–79 Member, Editorial Board for Biometrics

Professional Honors

- 1952 Elected Fellow, Royal Statistical Society
- 1968 Elected Fellow, American Statistical Association
- 1977 Elected Member, International Statistical Institute

Solomon, D. L. (1968–81)

Professional Position in Societies and Organizations

- 1972–77 Representative to Biological Sciences Section of AAAS, Biometric Society (ENAR)
- 1975–79 Associate Editor, Biometrics
- 1975–81 Member, Editorial Board, Mathematical Reviews
- 1975–77 Member, Regional Advisory Board, Biometric Society (ENAR)
- 1977–81 Member, Northeast Agricultural Experiment Station Statisticians (NEC-35 Experimental Design and Data Analysis)
- 1977–78 Chairperson, Northeast Agricultural Experiment Station Statisticians (NEC-35 Experimental Design and Data Analysis)
- 1977–79 Coordinator, NATO Advanced Study Institute and International Statistical Ecology Program Research Workshops
- 1981 Program Chairman, Biometric Society (ENAR)

Cady, F. B. (1971–86)

Professional Positions in Societies and Organizations

- 1972–74 Secretary/Treasurer, Biometric Society (ENAR)
- 1973–75 Program Chairman-Elect, Statistical Computation Section, ASA
- 1976 Program Chairman, Statistical Computation Section, ASA
- 1975–79 Editor, Biometrics
- 1975 President-Elect, Biometric Society (ENAR)
- 1976 President, Biometric Society (ENAR)
- 1976–79 Member, Electorate Nominating Committee, Section U, AAAS
- 1979 Chairman, Electorate Nominating Committee, Section U, AAAS

Wood, C. L. (1973–77)

Professional Positions in Societies and Organizations

- 1976–77 Publications Officer, Statistical Education Section, ASA

Schwager, S. J. (1978–88)

Professional Positions in Societies and Organizations

- 1978 Reviewer, Mathematical Reviews
- 1978–88 Judge, ASQC and Youden Prizes
- 1985–88 Editorial Board Member, Communication in Statistics, Series A

Casella, G. C. (1980–88)

Professional Positions in Societies and Organizations

- 1980–88 Associate Editor, Journal of the American Statistical Association
- 1984–86 Member (Biometrics Section), Board of Directors, ASA
- 1985–88 Associate Editor, Book Reviews, Journal of the American Statistical Association
- 1987–88 Associate Editor, The American Statistician
- 1987–88 Chairman, Committee on Restructuring the Constitution, ASA ‘ Professional Honors
- 1988 Elected Fellow, American Statistical Association
- 1988 Elected Fellow, Institute of Mathematical Statistics

McCulloch, C. E. (1982–88)

Professional Positions in Societies and Organizations

- 1985–87 Member, Regional Advisory Board, Biometric Society (ENAR)

Professional Honors

- 1986 Certificate of Appreciation, American Society of Quality Control

As may be observed from the above, the Biometrics Unit faculty has contributed considerably to the functioning of professional societies and organizations, especially the Biometric Society, ENAR. In addition to the above, the professional staff have given papers at most meetings of the American Statistical Association, the Biometric Society, ENAR, and the Eastern Region of The Institute of Mathematical Statistics. They have organized special sessions, chaired sessions, acted as discussants, and served on local arrangements committees. A description of most of these activities may be found in the 1st through the 40th Annual Reports. They have written many book reviews, reviewed many project proposals, reviewed many manuscripts from journals in a variety of fields, and performed several other professional services.

In addition to the above, there are always college and university committees. Federer and Solomon spent numerous hours in this kind of activity. Other members have also done their fair share, especially in light of the teaching and advising loads. During the early years, Biometrics Unit Faculty chaired and organized Synapsis and the Plant Breeding Seminars. In fact, the writer did both of these in the same year! Thereafter, two different people handled the Seminar and Synapsis. Since about 1960, these two jobs have been entirely handled by Plant Breeders.

9. THE FUTURE FOR THE BIOMETRICS UNIT

As the Biometrics Unit Personnel embarks on their second 40-year stint, they are in a very good position to maintain the eminence of the Biometrics Unit. A highly competent faculty is in place, and they are creative and energetic. Whether or not they achieve the goals of the original 10 years, the 20 recommendations of the Comprehensive Review Committee in 1960 (see 13th Annual Report), or the Recommendations of the 1977 Review, only time will tell.

This writer sees some dangers on the teaching and research scenes. With respect to the latter, the increasing numbers of undergraduate advisees and the large numbers of graduate minors can only lead to reduced research productivity. Likewise, offering additional courses such as Stat and Biom 215, no matter how badly they are needed, can only lead to reduced time for research and professional activities. In a University such as Cornell, despite the great emphasis put on research for promotions and grants, an individual has to fight for time to do research and professional activities outside Cornell. In many situations, the only solution is to do research at home or some isolated location and to not answer the telephone! For some researchers, this cannot be done at home and these individuals have to make time for research. If one has a heavy teaching schedule and still does much research, the teaching probably suffers. To maintain high quality in all areas means not to have an overload in any.

With regard to the teaching, the statistical design expertise of the Kiefer, McCarthy, Robson, and Federer type is not present in the current Statistics Faculty at Cornell, let alone the Biometrics Unit. There is no member of the current full-time Statistics Faculty at Cornell who can be considered as a significant contributor to survey design, experiment design, or treatment design theory and who is conversant with the subtleties of split block and split plot designs and with covariance for complex designs. Several are able to present (not necessarily teach) a course at the Cochran-Cox level and content. The entire Statistics Faculty at Cornell (in Mathematics, in Economic and Social Statistics, in Industrial and Operations Research, and in the Biometrics Unit) will need to study future directions. Three areas that should be considered are statistical design, statistical modeling, and statistics in biotechnology. The expertise and creative ability of D. S. Robson may be impossible to replace. Sampling and estimation in wildlife populations is a fourth area that should be seriously considered in hiring future faculty.

